



LIFE and Invertebrates Stepping up to the challenges

**Conclusions of the 2018 LIFE Platform Meeting on
invertebrates and 2019 ex-post visits to closed projects**

Summary Report

John Houston, María José Aramburu and Darline Velghe

Report prepared by John Houston, María José Aramburu and Darline Velghe based on conclusions of the 2018 LIFE Platform Meeting on invertebrates and 2019 ex-post mission reports from Neemo monitoring experts.

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Summary

When considering invertebrates and the LIFE programme, there are examples of habitats improved, individual species showing recovery and more knowledge of the life histories and requirements of species. But this ex-post study infers that much more needs to be done to build on this work to protect European threatened invertebrates, especially in grassland habitats, woodlands and wooded meadows and freshwater habitats.

The threats are substantial: agricultural intensification, use of pesticides, abandonment of traditional meadow management, loss of open habitats, forestry practice, modification of rivers (e.g. dams), water quality and land use change (e.g. urbanisation and tourism development in coastal areas), amongst others. Climate change is posing additional pressure on invertebrates (through increase of wildfires, droughts and floods), especially in Mediterranean countries, and may exacerbate the impact of other threats affecting them. These threats are described in both the IUCN European Red List studies, in Natura 2000 habitat management models, in Habitat Action Plans, the EU Pollinators Initiative and others. The crisis affecting Europe's invertebrate biodiversity is addressed in some depth in the EEA *State and Outlook 2020* report on the European environment, indicating the growing political concern over issues such as the decline in wild pollinators.¹

But this level of concern is relatively recent. Invertebrates have generally been overlooked from a lack of political interest at national and local level (slugs are not so 'sexy' as the Iberian lynx or the imperial eagle) and the lack of awareness among citizens on the role of invertebrates in ecosystem services and the provision of goods (e.g. bees for the pollination of plants or pearl mussels for improving water quality in rivers). Increasing awareness of politicians and other stakeholders on the relevance of invertebrates for the sustainability of socio-economic activities is vital for improving the current situation.

In many studies and reports the important and significant role of the LIFE programme is stressed². LIFE leads the way in addressing threats, in finding solutions and in disseminating results. To date the LIFE programme for nature has mirrored the overall aims of the Habitats and Birds Directives in addressing priorities for conservation. Conservation of Habitats Directive Annex I habitats and Annex II and Annex IV species are drivers for LIFE projects and therefore many invertebrates can be 'target species'. But 'invertebrates' is an umbrella term covering many phyla and perhaps should be seen as more integral to the fabric of biodiversity. Specific habitats may host thousands of invertebrate species, giving a different perspective to traditional conservation activity and requiring thinking about biodiversity, connections and inter-dependencies (e.g. plants and pollinators, soil forming etc). In a sense this means mainstreaming invertebrates into our thinking, being 'invertebrate-aware' in habitat management, using key species as indicators of habitat and environmental quality, and recognising the special role of healthy invertebrate communities in ecosystems and ecosystem services.

This ex-post study continues a discussion on LIFE and invertebrates which started with the first platform meeting on this subject in 2011 and the publication of *LIFE and invertebrate conservation* in 2012³. Since then invertebrates have been given more attention in the LIFE regulation and in inviting applications although, looking at the number of projects funded, this might not have translated into

¹ <https://www.eea.europa.eu/soer-2020/intro>

² The conference report on the Future of the LIFE programme, Brussels, 6-7 November 2019, highlights many of the issues raised in this ex-post report regarding action for invertebrates: a more flexible approach, influencing the Common Agricultural Policy, developing large-scale projects and improving knowledge.

³ <https://ec.europa.eu/environment/archives/life/publications/lifepublications/lifefocus/documents/invertebrates.pdf>

significantly more projects with actions for invertebrates. A second LIFE platform meeting on invertebrates was held in 2018 confirming the need to increase the profile of invertebrates in projects and programmes.

Ex-post studies are a way to check on the success of projects and the selection of projects evaluated in this exercise highlight several potential success stories and examples of projects addressing biodiversity-rich habitats or specific species but also shows that, for many habitats and species, often very challenging threats remain and it may be the loss of invertebrate species which first highlight wider problems.

This report introduces the 2019 ex-post evaluation of 20 LIFE projects, summarises some of the common issues, discusses wider issues arising from the 2018 platform meeting and presents a short case study from each project. It also uses the opportunity to make some general recommendations for EU programmes arising from the experience of LIFE and to reinforce a number of recommendations for the LIFE programme itself.

Introduction

The quiet and underappreciated extinction of invertebrates has important consequences for ecosystem function and human well-being⁴.

The decline of insect diversity and abundance across the world is well evidenced in the scientific literature. The recent review of Sánchez-Bayo and Wyckhuys (2019)⁵ suggests dramatic rates of declines across the globe. There are also many European studies of direct relevance to the EU and the LIFE programme (e.g. Seibold et al. 2019⁶ and Hallmann et al. 2017⁷). The losses, and the potential impact on ecosystem services such as pollination, are becoming better understood at the international level leading to international responses such as the EU Pollinators Initiative⁸. According to the European Commission, around 84% of crop species and 78% of wild flower species in the EU alone depend, at least in part, on animal pollination. Up to almost €15 billion of the EU's annual agricultural output is directly attributed to insect pollinators.

The ex-post study included 11 projects which had some focus on butterfly species. The EU Grassland Butterfly Indicator (Van Swaay et al. 2019⁹) shows a significant decline of 39% of selected butterfly species, most of which occurred in the periods 1990-1998 and 2002-2012. Although the rate of decline seems to have slowed in 2012-2017 compared with the previous period, the picture is still of long-term decline. In north-western Europe intensification of farming is the most important threat to grassland butterflies, while abandonment of grasslands is more important in other parts of Europe (Van Swaay et al. 2019). Thus, protecting semi-natural grasslands and reversing fragmentation is essential to halt further losses.

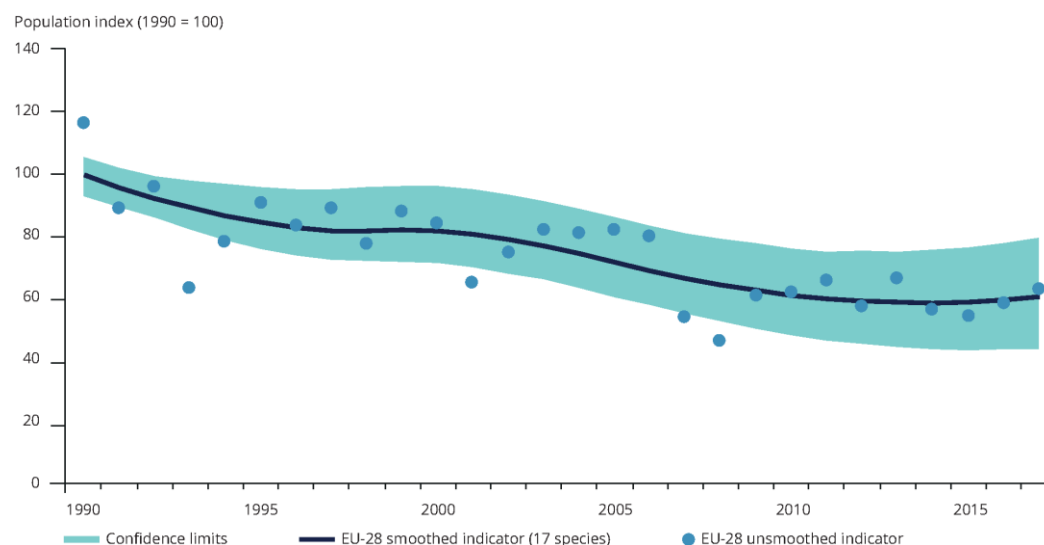


Figure 1. European Grassland Butterfly Indicator © European Environment Agency (EEA) 2019¹⁰

⁴ Eisenhauer, N., Bonn, A. and Guerra, C.A. (2019). Recognizing the quiet extinction of invertebrates. *Nature Communications* 10:50 <https://doi.org/10.1038/s41467-018-07916-1>

⁵ Sánchez-Bayo, F. and Wyckhuys, K.A.G. (2019). Worldwide decline of the entomofauna: A review of its drivers. *Biological Conservation* 232 8-27 <https://doi.org/10.1016/j.biocon.2019.01.020>

⁶ Seibold, S., Gossner, M.M., Simons, N.K. et al. (2019). Arthropod decline in grasslands and forests is associated with landscape-level drivers. *Nature* 574, 671–674 <https://www.nature.com/articles/s41586-019-1684-3>

⁷ Hallmann, C.A. et al. (2017). More than 75 percent decline over 27 years in total flying insect biomass in protected areas. *PloS one*, 12(10), e0185809 <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0185809>

⁸ https://ec.europa.eu/environment/nature/conservation/species/pollinators/index_en.htm

⁹ Van Swaay, C.A.M. et al. (2019). *The EU Butterfly Indicator for Grassland species: 1990-2017: Technical Report*. Butterfly Conservation Europe & ABLE/eBMS (www.butterfly-monitoring.net)

¹⁰ Methodology: <http://www.eea.europa.eu/publications/the-european-grassland-butterfly-indicator-19902011>

The EU is giving particular attention to the link between natural habitats and wild pollinators. Members of the European Parliament (MEPs) have urged the Commission to step up its work on the Pollinators Initiative by proposing that reducing pesticide use must now become a key objective of the Common Agricultural Policy¹¹.

The EU Pollinators Initiative identifies a set of actions to be taken by the EU and Member States to address the decline of pollinators under three priorities: improving knowledge of pollinator decline, tackling the cause of pollinator decline and raising awareness, including engaging society at large.

The most relevant actions for the LIFE programme are **tackling the cause of pollinator decline** to:

- Conserve endangered pollinator species and habitats
- Improve pollinator habitats on and around farmland
- Improve pollinator habitats in urban areas and the wider landscape
- Reduce the impacts of pesticide use on pollinators
- Reduce the impacts of invasive alien species on pollinators

The Commission will be developing action plans for the most threatened pollinator species and habitats listed in the Habitats Directive, and will support Member States and stakeholders in implementing them, including through the LIFE programme.

Against this growing awareness of the decline of invertebrate species and the possible consequences of such losses what more can the LIFE programme offer?

LIFE and invertebrates

For some years there has been concern about an under-representation of actions for invertebrates in LIFE Nature projects. The issue was first addressed at the LIFE Platform Meeting on terrestrial invertebrates hosted by the UK project Cornwall Moors (LIFE03 NAT/UK/000042) in 2011. This led to the publication *LIFE and invertebrate conservation* and a change to the LIFE multiannual work programme to invite projects also to address species listed in the IUCN European Red Lists of Threatened Species.¹² Although this opportunity has not been so well publicised or taken up, as an example LIFE BEETLES (LIFE18 NAT/PT/000864) targets three beetle species endemic to the Azores which are not on the Habitats Directive but are classed as Critically Endangered on the IUCN list.

In 2018 a second LIFE Platform Meeting, hosted by the EcoCo LIFE project (LIFE13 NAT/UK/0000428), was held to review how well the LIFE programme has targeted actions for threatened invertebrates and to consider what more the programme could do to support these sometimes forgotten species groups¹³. The meeting considered all IUCN European Red Lists, other Red Lists and other relevant actions such as the EU Pollinators Initiative.

¹¹ <https://www.europarl.europa.eu/news/en/press-room/20191212IPR68921/bees-meps-call-for-reduction-in-use-of-pesticides-to-save-europe-s-bees>

¹² [The LIFE multiannual work programme for 2014-2017](#) invited projects targeting threatened species that are not included in the annexes of the Habitats Directive but that have a status of 'Endangered' or worse in the European Red Lists (http://ec.europa.eu/environment/nature/conservation/species/redlist/index_en.htm) or in the IUCN Red List for those species that are not covered by the European Red Lists (<http://www.iucnredlist.org/>).

¹³ The agenda, background note, presentations and summary report are available on the EcoCo LIFE website. <https://www.ecocolife.scot/node/336>

A review of the LIFE database presented at the 2018 meeting shows that LIFE projects have targeted 21 species of molluscs, 19 species of beetles (Coleoptera), 15 species of butterflies and moths (Lepidoptera) and 10 species of dragonflies and damselflies (Odonata) listed in the annexes of the Habitats Directive. The main habitats targeted have been natural and semi-natural grasslands (with 93 projects), forests (87 projects), bogs and mires (69 projects) and freshwater habitats (67 projects). The main actions have been open habitat restoration, wetland restoration, forest management and species reintroduction. It should be noted that these projects are only those where Annex II and IV invertebrate species have been project targets (i.e. included in the project design) and the numbers do not include the many other projects which have focused on habitats or other species and where invertebrate populations are in part an indicator of success.

The 2018 platform meeting addressed the following questions:

- What projects do we need to improve the conservation status of threatened invertebrates?
- What is the best way to target the overlooked groups?
- How can we address the ecological, taxonomic and biogeographical knowledge gaps?
- Would a focus on umbrella species improve the overall situation for invertebrates?
- Are habitat restoration projects adequately targeting invertebrate species?
- Can invertebrate assemblages be used as an indicator of habitat quality?
- What features of landscape-scale approaches specifically address the needs of invertebrates?
- How do we plan for long-term monitoring?

These questions are also relevant to the current study. A Summary for Policy Makers was published¹⁴ (included as Annex 1 of this report) highlighting how the LIFE programme can do more for invertebrate conservation. Several aspects of the summary for policy makers are picked up in the current report and/or included in recommendations.

The review of progress shared at the platform meeting is complemented by this ex-post study looking in more depth at the successes of projects targeting invertebrates and some of the difficulties these projects have faced. The platform meeting, the detailed ex-post evaluations (unpublished reports to the Commission) and this summary report form a package focusing on LIFE and invertebrates and putting forward recommendations as to how the EU programmes such as the Common Agricultural Policy and LIFE programme might step up their support for the conservation of invertebrate biodiversity¹⁵.

¹⁴https://www.ecocolife.scot/sites/default/files/LIFE%20Invertebrates%20Platform%20Stirling_Summary%20for%20Policy%20Makers%20_final.pdf

¹⁵ The work of the LIFE programme to date will be represented at the XXVI International Congress of Entomology in Helsinki, Finland, July 19-24 2020 <https://ice2020helsinki.fi/>

Background for 2019 ex-post study on invertebrates

20 LIFE Nature projects on the theme of invertebrates were selected for ex-post evaluation in 2019.

Projects are evenly split between those projects which explicitly target Annex II and Annex IV species and those where invertebrate species or invertebrate biodiversity may be a measure of habitat quality. In addition, the mix of projects covered a range of habitat types: forests, grasslands, bogs & fens, heaths & open habitats and aquatic habitats. The longlist showed that there were more funded projects on invertebrates in northern and western Europe, but, knowing from IUCN reports that pressures and threats in Mediterranean countries are more acute, the selection ensured good coverage of southern Europe. A specific evaluation of the challenges for LIFE projects addressing invertebrates in the Mediterranean region is included.

Four projects also targeted the Annex I habitat 6210 *semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)* (* important orchid sites), a key habitat for butterfly species and the subject of the first EU Habitat Action Plan published in 2019¹⁶. The action plan confirms the importance of grassland habitats for invertebrate biodiversity.

Table 1. List of LIFE projects selected

Member State	LIFE project	Acronym	Project type	Habitat type
France	LIFE06 NAT/F/000142	Lauter-Donon	Habitat	Forests
Spain	LIFE03 NAT/E/000057	Artrópodos Extremadura	Species	Aquatic
Spain	LIFE03 NAT/E/000051	Margarita Sanabria	Species	Aquatic
Spain	LIFE07 NAT/E/000762	Campanarios de Azaba	Habitat	Forests
Germany	LIFE08 NAT/D/000002	Keiljungfer	Species	Aquatic
Austria	LIFE06 NAT/AT/000124	UVOR	Species	Grasslands
Germany	LIFE10 NAT/DE/000005	LIFE rund ums Heckengäu	Species	Grasslands
Italy	LIFE09 NAT/IT/000118	RICOPRI	Habitat	Grasslands
Italy	LIFE03 NAT/IT/000109	Lomellina	Habitat	Forests
Denmark	LIFE05 NAT/DK/000151	ASPEA	Species	Heaths / Open
Cyprus	LIFE09 NAT/CY/000247	ICOSTACY	Species	Forests
Finland	LIFE08 NAT/FIN/000596	Boreal Peatland	Habitat	Bogs & Fens
Poland	LIFE08 NAT/PL/000513	Xeric Grasslands	Habitat	Grasslands
Latvia	LIFE09 NAT/LV/000240	EREMITA MEADOWS	Species	Grasslands
Belgium	LIFE03 NAT/B/000019	Saint Hubert	Habitat	Bogs & Fens
Belgium	LIFE04 NAT/BE/000010	Liereman	Habitat	Heaths / Open
Italy	LIFE10 NAT/IT/000239	RARITY	Species	Aquatic
Poland	LIFE06 NAT/PL/000100	Wetlands Butterflies	Species	Bogs & Fens
Poland	LIFE09 NAT/PL/000259	Pustynia Błędowska	Habitat	Heaths / Open
Czech Republic	LIFE09 NAT/CZ/000364	Butterflies CZ-SK	Species	Grasslands

¹⁶ https://ec.europa.eu/environment/nature/natura2000/management/pdf/EUHabitat_ap6210.pdf

Methodology and specific issues addressed

Ex-post evaluations focus on medium- and long-term effects (outcomes and impact) and an assessment of sustainability, including site protection, conservation measures and ongoing resources. LIFE projects seldom operate in isolation: ex-post evaluation can assess links to other projects (on the same species, same habitat, with the same project coordinator) and, where relevant, additional information on a habitat or species can be provided at national, biogeographical, EU or a wider scope to put the project results in perspective.

Wherever possible the Habitats Directive Article 17 reporting was used to compare project level results to national reporting. The draft national 2019 Article 17 reports (for the period 2013-2018) were used where available. In some cases national experts also attended the mission, or corresponded with the ex-post evaluator, and in one case the project coordinator undertook a new survey to obtain up-to-date information. A close fit to Article 17 reporting was also ensured by looking at what nature conservation 'measures' had been applied.

The specific questions were:

1: Has the conservation status of the target habitat or species improved as a result of the measures applied by the project? And, is maintenance or enhancement of the target habitats or species confirmed by monitoring of habitat condition and species population, including trends?

2: Is the monitoring of invertebrate species' response to management measures a good indication of habitat quality? And/or is habitat quality a good indication of species diversity and population size?

3: Did the project have a catalytic role in disseminating best practice, developing guidelines, preparing plans, inspiring other projects, bringing together relevant stakeholders, etc? Were there any particular issues at project level in relation to actions for invertebrates? Can your experience help the Commission to encourage more applications for projects on invertebrates?

Overview of results

Most ex-post missions confirm an already reported improvement in the conservation status of the target habitat or species between the situation prior to the project and the situation at the end of the project. The ex-post perspective gives added value by seeing whether the gains could be sustained at project level and whether the project acted as a catalyst for follow-on projects or for replication at regional or national level.

Short snapshots of the projects are given in the case study section of the report (Annex 2). The range of results include projects where:

- The situation improved during the project and has continued to do so after the end of the project, e.g. ASPEA (DK), St-Hubert (BE)
- The situation improved during the project but there have been fluctuations (some natural) since the end of the project, e.g. Wetlands Butterflies (PL), RICOPRI (IT)
- The project addressed a significant (up to 100%) proportion of the habitat or species – strongly linked to Article 17 reporting, e.g. ICOSTACY (CY), Boreal Peatland (FIN)
- Favourable conservation status was achieved for targeted habitats or species, e.g. Pustynia Błędowska (PL)
- A negative trend was slowed or halted, and a slow recovery has begun, e.g. Butterflies CZ-SK (CZ)
- Significant long-term problems remain, e.g. Margarita Sanabria (ES), UVOR (AT), Lomellina (IT)

Although there is an ideal scenario in project design where a project turns an unfavourable situation into a recovering situation and then, 5-10 years after the project, reaches a favourable situation, this is not a pattern seen in the project results for invertebrates. Few projects show the ideal scenario: most show that it is more complicated and that habitat and species recovery is a long road with bumps along the way. Several reports show that two or more LIFE projects are often necessary and even then, favourable condition might not be reached. When dealing with the annual cycles of most insects, year-by-year weather fluctuations have a major impact on populations.

Effects of the projects (results, outcomes and impacts)

A previous external ex-post study¹⁷ showed that the **results** of a project can be described in terms of changes in knowledge, skills, awareness, attitudes and motivation.

Table 2. Examples of results from the current review

Knowledge	Example: Learning about special habitats and species of the Natura 2000 area	<ul style="list-style-type: none"> • Increase in knowledge of dragonflies and damselflies in Extremadura, Spain, and publication of 'Odonates of Extremadura' • The Danish project on marsh fritillary encouraged work by Århus University to increase scientific knowledge • Significant improvement of knowledge base on rare invertebrates in Cyprus • Genetic studies on <i>Osmoderma</i> (hermit beetle) species in Latvia confirmed that the species present is <i>Osmoderma barnabita</i>
Skills	Example: Developing skills and good practice techniques	<ul style="list-style-type: none"> • Meadow managers in Germany help to show farmers how to manage meadows for butterfly species in county of Böblingen • Publication of handbook for restoration of drained peatland in Finland based on 25 years experience • Establishment of a long-term monitoring plan for birds, vegetation and invertebrates (butterflies and dragonflies) on the Ardennes plateaux • Demonstration of new techniques for meadow management in Poland to protect butterfly species in the Vistula river valley
Awareness	Example: Local stakeholders becoming aware of the importance of local nature	<ul style="list-style-type: none"> • A partnership with the Salzburg Outdoor Museum helped the Untersberg Vorland project reach visitors • Rice farmers in the province of Pavia, Italy, becoming more aware of the need to find a balance between farming practice and nature • The Butterflies CZ-SK project contacted 1,200 owners and informed them about the value of their land - 80% of the project area is now managed by owners
Attitudes	Example: Improving local stakeholders' attitudes from indifference/hostility to support	<ul style="list-style-type: none"> • Local community of Jerup in Frederikshavn adopted the marsh fritillary as their village logo • Willingness of landowners in Latvia to maintain wooded meadows as habitat for saproxylic beetles • The successful project on the St Hubert plateau in Belgium was led by a hunters' association and involved

¹⁷ COWI (2009): Ex-post evaluation of projects and activities financed under the LIFE programme: Final Report Parts 1 to 6 <http://ec.europa.eu/environment/life/publications/lifepublications/evaluation/>

		<p>many private landowners</p> <ul style="list-style-type: none"> Initial resistance from landowners in De Lieberman in Belgium was overcome and a successful partnership has developed
Motivation	Example: Landowners being inspired to carry out conservation work	<ul style="list-style-type: none"> Increasing value of eco-tourism in Extremadura based on birds and dragonflies Campanarios de Azaba estate declared Spain's first 'Entomological Reserve' by the Spanish Entomology Association Klub Przyrodników which led the Polish Xeric Grasslands project was actively involved in the Eurasian Dry Grassland Group and is now a partner in LIFE projects outside Poland Cooperation and networking by the Polish Wetlands Butterflies project led to the Warsaw Wetlands Declaration in 2010

This new situation should lead to desirable **outcomes** where there is a real change in behaviour, practices, policies and procedures, an essential aspect of sustainability.

Table 3. Examples of outcomes from the current review

Behaviour	Example: visitors avoiding damage/disturbance to nature (using paths, etc.)	<ul style="list-style-type: none"> Development of tourist infrastructure in the Pustynia Błędowska desert in Poland and creating a new attraction whilst controlling visitor pressure
Practices	Example: changing management practices (e.g. forestry) to accommodate nature interests	<ul style="list-style-type: none"> The river basin authority in the Duero river in Spain following the project guidelines for freshwater pearl mussel in its river maintenance work Reducing grazing pressure in Campanarios de Azaba estate in western Spain to protect open evergreen oak habitat (dehesa) Purchase of livestock in the Apennines (province of Rome) to counter abandonment of traditional pasturage Piloting of mobile pasturage methods in Poland, now widely used by other organisations Development of new agri-environment measures for butterflies in the Czech Republic and Slovakia
Policies	Example: adopting new local/regional/national legislation to protect habitats or species	<ul style="list-style-type: none"> Adopting management plan for four species of dragonfly in Extremadura, the first in Spain Inclusion of appropriate management activities (mowing and grazing) in the Danish Rural Development Programme to conserve marsh fritillary butterfly Preparation of a national habitat protection programme for habitat type 6210 xerothermic grasslands in Poland Regional regulation for protection of fresh-water crayfish in Friuli Venezia Giulia region of Italy and prohibition of release of invasive crayfish
Procedures	Example: delivering a policy for land purchase to protect nature	<ul style="list-style-type: none"> Transfer of management duties from National Forest Office to local administrations in the Lower Lauter Valley and Vosges mountain range in north-east France to improve local delivery of Natura 2000 actions Establishment of landscape preservation unions (Landschaftserhaltungsverbände, LEV) in Germany to deliver sustainable meadow management

Almost all projects show some impact on the target habitats or species. Those which target a significant percentage of the total area of habitat or population of a species at Member State level have the potential for the greatest impact. The study also shows that, in several cases, it has taken a number of LIFE projects in the same area or across habitat or species range to secure an improvement in conservation status. In this context, the St-Hubert project and its successors created a meta-project which has delivered long-lasting results at a landscape scale.

Sustainability

The sustainability of a project is a combination of the way the effects (i.e. results, outcomes and impacts) lead to long-term management practices, protection of habitats and species and stakeholder support.

Assessing sustainability includes checking the current conservation status of target habitats and species to see what has changed, what ongoing measures are required, whether a management plan was prepared, whether it was approved by relevant authorities, whether it is being resourced and implemented, and whether obstacles still remain. In addition, the assessment checks on whether monitoring has continued and reports have been generated, whether Natura 2000 areas were enlarged, whether there is continuity of project management and creation of permanent jobs.

Sustainability is the project 'legacy' which includes to what extent relevant bodies continue to support the project, whether there is capacity to continue the work and whether stakeholders still support and benefit from project results.

Good examples of sustainability in this study are:

- The condition of habitats and species continue to improve on the St Hubert Plateau as part of a long-term meta-project in the Belgian Ardennes
- The continuation of agri-environment schemes for the maintenance of xeric grasslands in Poland
- One-off restoration of boreal peatlands in Finland through land purchase and restoration of hydrology requiring little aftercare
- Integration of best practice for grasslands into national agri-environment policy in the Czech Republic with a 20-fold increase in the area under management since the end of the project
- Pilot work on rare invertebrates in Cyprus being continued through the 2019 LIFE Integrated Project CY-Physis

Many of the projects in this study, for example those involving traditional grassland management in hay meadows, are dependent on agri-environment schemes through national Rural Development Plans. However, this dependency is also a risk.

The ex-post study by COWI (2009) highlighted as key factors linked to sustainability:

- **Funding** for recurring activities
- An **organisation** for maintaining planned post-project measures
- The formal participation of relevant **authorities**
- **Land purchase** leading to full control of land use
- Effects of a targeted **awareness-raising** campaign
- **Legal protection** and/or enlargement of Natura 2000 sites
- **One-off measures** for nature conservation which have a sustainable character (e.g. drain blocking)

The relative importance of these will vary from project to project.

Relevance to the LIFE programme

As well as assessing project-specific outputs and sustainability, the ex-post evaluations can also look at issues relevant to the LIFE programme as a whole. Examples, also found in the case studies from this study, may show aspects of:

- The value of **pump-priming** supporting the initial stages of restoration work
- Projects being a **catalyst** for more work in an area or other areas and for **follow-on LIFE projects**
- The value of assisting **capacity building** in organisations and project areas
- The value of **promoting dialogue** and creating **partnerships** with stakeholders
- Providing **demonstration models** of innovative **best practice**
- **Disseminating** results and **networking** with similar projects
- Being able to measure real **conservation benefit**
- The **incentive value** of projects in attracting additional funding
- Establishing **long-term management programmes** under agri-environment schemes
- **Integration** of conservation with other policy sectors
- Positive **influence** on the local economy, local community and stakeholders

Common issues

A short extract of each ex-post study is included at the end of this report (Annex 2) focusing on the quantitative results of projects. In most cases it was possible to report on the status of target habitats and species, although the lack of funding for ongoing monitoring was identified as a common problem, and especially for Mediterranean projects. Information on measures applied is evident in most reports, although only in some cases has this been cross-referenced to the standard coding for measures used in Article 17 reporting.

A number of common themes arise from the individual project reports:

1. The severe threat to many species from catchment-scale or landscape-scale change and the need for sustained management through agri-environment schemes and similar programmes
2. The importance of Habitat Action Plans for semi-natural grasslands
3. Problems with sustaining and funding monitoring of invertebrates
4. The variability of invertebrate populations from year to year in response to weather
5. The lack of knowledge of many species and the need to allow more scientific studies alongside conservation activity
6. Threats to endangered invertebrates are generally more acute in southern and eastern Europe
7. The difficulties in relating project-level data to regional and national data and Article 17 reporting
8. In some cases Annex II and Annex IV species might not be the best indicator of habitat quality
9. The role of Species Action Plans
10. Making best use of existing best practice and advice to landowners
11. Should co-financing be higher?
12. Specific issues arising from assessment of Mediterranean projects

These are discussed in the sections below:

1. The severe threat to many species from catchment scale or landscape scale change and the need for sustained management through agri-environment schemes and similar programmes

Most of the projects evaluated have focused on relatively small areas of habitat with the intention to see their demonstration work replicated across a wider area. The narrow focus is sometimes necessary to better understand the species and fine-tune management practice but may miss the bigger picture. In the case of freshwater pearl mussel in Spain (LIFE03 NAT/E/000051), or dragonflies in the rice cultivation area in the province of Pavia in Italy (LIFE03 NAT/IT/000109), there are insidious threats from catchment management practice or modern agricultural techniques which could lead to species extinction.

There is a concern in several project examples that much depends on the next Common Agricultural Policy (CAP) period from 2021-2027 and whether targeted agri-environmental schemes are available and competitive. If schemes cannot be made attractive it will be difficult to slow down the intensification of agriculture, leading to further gradual deterioration of target habitats and a further decrease in the conservation status of target insect species. The threats from current agricultural practice to invertebrate biodiversity, as highlighted in many examples in this report, are evident and growing.

There is a need for a strategic approach using all the tools available (Habitat Action Plans, EU Pollinators Initiative, Prioritised Action Frameworks (PAFs), Common Agricultural Policy (CAP) and the

linked Rural Development Programmes (RDPs) etc.) to address the crises in European grasslands and their associated species.

The LIFE programme has the potential to generate multiplier effects through replication of conservation measures through national RDPs. For example, the project Butterflies CZ-SK was able to develop a new agri-environment measure for butterflies on 120 ha and see it now applied to c. 2,500 ha in the Czech Republic. But such examples need to become the norm and the success of targeted agri-environment measures should be evaluated so that, where necessary, improvements can be made.

The scale of the problem with the decline in essential invertebrates and the area affected requires strategic solutions. This study points towards the future and the value of both a PAF and Integrated Projects (IPs)/ Strategic Nature Projects (SNaPs). For example, the 10-year IP ForEst&FarmLand (LIFE18 IPE/EE/000007) led by the Estonian Ministry of Environment includes four actions for farmland: designing measures and restoration of semi-natural grasslands, designing nature friendly farming landscapes, assessing effectiveness of CAP support schemes for farmland biodiversity and developing an action plan for pollinators. These measures, taken together, could go a long way to halting and reversing the decline in wild pollinators and endangered invertebrates. It does not mean that there is no role for traditional LIFE nature projects: they may still be the best approach when targeting hotspots or addressing a single species.

2. The importance of Habitat Action Plans for semi-natural grasslands

Half of the projects in this study are linked to maintenance of the grassland habitats, 6210* semi-natural dry grassland (*important orchid sites), 6230* Species-rich *Nardus* grasslands, 6410 *Molinia* meadows and 6510 lowland hay meadows, as shown:

Table 4. LIFE projects linked to maintenance of grassland habitats

Project	6210*	6230*	6410	6510
LIFE06 NAT/F/000142 Lauter-Donon				
LIFE06 NAT/AT/000124 UVOR				
LIFE10 NAT/DE/000005 Rund ums Heckengäu				
LIFE09 NAT/IT/000118 RICOPRI				
LIFE05NAT/DK/000151 ASPEA				
LIFE08 NAT/PL/000513 Xeric Grasslands				
LIFE03 NAT/B/000019 LIFE Saint Hubert				
LIFE04 NAT/BE/000010 Liereman				
LIFE06 NAT/PL/000100 Wetland Butterflies				
LIFE09 NAT/CZ/000364 Butterflies CZ-SK				

The recently published EU Habitat Action Plan (HAP) for habitat type 6210 semi-natural dry grasslands also has some relevance to related habitats such as 6230, 6410 and 6510 above. In terms of invertebrates, the HAP confirms that the habitat “*is a high priority for conservation of wild pollinator species, such as butterflies, wild bees or hoverflies, as well as for other rare or protected species*” and that “*dry calcareous grasslands are the most species rich habitats for butterflies in Europe*”. Characteristic butterfly species include Danube clouded yellow *Colias myrmidone* and large blue *Maculina arion*, both of which are highly threatened (and targeted in the Butterflies CZ-SK LIFE project). Dry calcareous grasslands are also considered good breeding habitats for marsh fritillary *Euphydryas aurinia* and large copper *Lycaena dispar*, both targeted by projects in this study. In terms of management the HAP states that “*local invertebrate populations have evolved strategies adapted*

to traditional practices. If there is a long history of grazing or mowing on a site, with a known management pattern, this should be continued to ensure adapted invertebrate life strategies can be maintained". This, in essence, is what most of the grassland LIFE projects aim to achieve.

It appears that the only way of doing so is through agri-environment support to farmers as the traditional methods no longer give a good income. Projects have addressed the challenges in several ways, by restoring habitats before reintroducing traditional practices (e.g. scrub control), purchasing land to gain greater control of management and also through incentives such as the purchase of livestock. The HAP and the earlier EU habitat management models for grassland types¹⁸ give habitat management recommendations for invertebrates. There is a need to publicise and promote these measures more widely and to set targets at regional (PAFs) and biogeographical levels.

There is an opportunity here for EASME, working with the Nature Unit, to use its thematic approach to help promote the HAP for grassland butterflies and to highlight those LIFE projects which are making a contribution to sharing knowledge and experience on habitat management. The HAP lists both Butterflies CZ-SK (LIFE09 NAT/CZ/000364) and Xeric Grasslands (LIFE08 NAT/PL/000432) as examples of projects targeting dry grasslands. More recent projects are also listed in the HAP including CZ-SK SOUTH LIFE, GrassLIFE, LIFE to grasslands, LIFE SUB-PANNONIC and LIFE Rhon grassland birds.

Relevant projects should be made aware of the HAP. For example, LIFE DRYLANDS (LIFE18 NAT/IT/000803) targets grassland habitats 2330 inland dunes, 4030 dry heaths and 6210 semi-natural dry grasslands. The project objectives and expected results make no mention of invertebrates yet a handbook of good practices is proposed. In a case such as this the beneficiaries should be asked whether they can do something to measure the impact of their work on invertebrate communities and when preparing good practice notes to refer to existing EU plans. There are several examples in this study of the need for more joined-up approaches.

3. Problems with sustaining and funding monitoring of invertebrates

From the way LIFE projects are designed and evaluated one would expect to find that all applied measures would be monitored. But this is not always the case, and the ex-post studies show that there are particular problems in maintaining monitoring studies on invertebrates for a number of reasons. The main one is lack of funding as almost all the projects evaluated report problems following the financial crisis of 2008. Other problems are the need to employ species experts (and these people are hard to find), wide fluctuations in the weather from year to year, from very wet to very dry, making it difficult to assess trends in butterfly populations, and often low numbers of individuals of target species. Differences in monitoring methodologies also lead to examples where data cannot be compared, for example, the counting of individuals, populations or locations.

Problems with the lack of qualified experts on invertebrates were confirmed by different sources¹⁹. It is an issue of particular concern in Mediterranean and eastern European countries (e.g. Romania). The low interest in invertebrates at all levels is leading to very few professional opportunities and precarious jobs, which discourages graduates, researchers and professionals from developing their careers in this field.

¹⁸ https://ec.europa.eu/environment/nature/natura2000/management/habitats/models_en.htm

¹⁹ Lobo J. and Araujo R. pers. comm.; Sirbu, I.: "Why monitoring and conservation assessment projects fail - A tale of mollusc species of Community interest in Romania". Tentacle n° 27 - February 2019 Newsletter of the IUCN/SSC Mollusc Specialist Group

In the case of Campanarios de Azaba in Spain (LIFE07 NAT/ES/000762), the lack of monitoring makes it virtually impossible to assess the effectiveness of any project actions. Given that this project based several of its conservation actions on initial surveys of invertebrates, the lack of end-of-project or post-project monitoring weakens the value of any good practice dissemination. This lack of follow-up monitoring is especially evident in Mediterranean projects.

Commitments to monitoring need to be better assessed at the application stages and throughout the project. Monitoring need not be over-complicated: the Ardennes meta-project in Belgium (LIFE03 NAT/B/000019) chose to use butterflies and dragonflies as target species for the very reason that they are reasonably easy to monitor using volunteers. The results from this work are some of the clearest of any LIFE project.

The LIFE programme should be able to support and adapt other EU-wide monitoring programmes. For example, Butterfly Conservation Europe's *Assessing Butterflies in Europe (ABLE)* project, established in 2018, will involve thousands of volunteers across Europe contributing information to a central database²⁰. Support will be given to countries which do not yet have national butterfly monitoring schemes (BMS), including Austria, Italy and Poland. These types of opportunities could perhaps be highlighted in national Prioritised Action Frameworks (PAFs) or as small actions within LIFE Integrated Projects for Nature or the forthcoming Strategic Nature Projects (SNAPs).

In summary, the advice for monitoring is:

- Identify specific indicators to measure the impact of actions on targeted species/taxa
- Carry out initial surveys to fill knowledge gaps and provide a baseline
- Ensure that standard accepted methodologies are used for censuses and surveys
- Design surveys taking into account the requirements for Article 17 reporting
- Get expert advice from specialists in planning and developing the monitoring programme

These considerations should be explicit in the guidelines for applicants, should be explained by the applicants and be checked/assessed during evaluation of LIFE proposals.

4. The variability of invertebrate populations from year to year in response to weather

The short-term variability of weather conditions from year to year is a major problem when monitoring insects, especially butterflies. For ex-post visits the intention is to collect quantitative information on habitats and species, in any form relevant, which can measure the pre-project situation, end-of-project results and 5 years+ (or other relevant date) after the project. This fits with the Key Performance Indicator (KPI) database which, for most variables, expects to see year-on-year improvement. However, providing information on species using just this approach is only meaningful for species with population growth trajectories not affected by fluctuations. For species with substantial fluctuations in abundance and distribution, more detailed data than t1, t2 and t3 are required for assessment of their conservation status. This is shown clearly in the report for UVOR (LIFE06 NAT/A/000124), where only by looking at long runs of data does a pattern of population fluctuations emerge.

It seems that in several cases the projects succeed in improving habitat condition, and also in ensuring continuity of management through agri-environment schemes, but that the response of the target species do not follow the same trajectory. One solution might be to develop and support long-term monitoring schemes linked to appraisal of the success of agri-environment schemes as

²⁰ <http://www.bc-europe.eu/index.php?id=504>

suggested above in the Estonian IP for farmland. In fact, all agri-environment measures targeting habitats known to be important for butterflies, or agri-environment measures specifically targeting invertebrates, should have long-term monitoring included.

5. The lack of knowledge of many species and the need to allow more scientific studies alongside conservation activity

The Spanish project *Conservation of endangered arthropods in Extremadura* (LIFE03 NAT/E/000057) helped to increase the knowledge about the distribution and habitat, life history and habitat requirements of invertebrate species, especially four species of dragonfly and damselfly. This knowledge led to the drawing-up of recovery, conservation and management plans which have helped safeguard the species for over a decade. In hindsight, the beneficiary considers that the scope of the project was limited by the requirements of the LIFE programme, where the requirement to avoid ‘basic research’ may be problematic for projects dealing with species for which information is very scarce, and where there is little or no management experience. The problem of poor data for many species, especially for “lesser-known groups such as invertebrates” was also raised at the *Future of the LIFE Programme* conference in 2019.

The Cypriot project ICOSTACY (LIFE09 NAT/CY/000247) addressed two species where the conservation status was “unknown”. This lack of knowledge is a particular problem for conservation of invertebrate species in Mediterranean countries. It was addressed in Cyprus with a first step being to genetically map the species and compare them to the species in the geographical area. The practical attention given to invertebrate species gave incentives for academic research to further study life cycles and genetics. However, deciding on the split between necessary research to meet project objectives and additional spin-off research may not always be easy in terms of allocating funding.

The need for further research is common to many of the project examples in this study. Where this is relevant to the project objective or where it has a wider European value, as in the case of genetics studies of *Osmoderma* species in Latvia (LIFE09 NAT/LV/000240), then LIFE funding may be appropriate, but such is the need for basic knowledge on key invertebrate groups across Europe that the use of Horizon 2020/Horizon Europe funding might also be appropriate, especially linked to aspects of ecosystem services such as soil formation and pollination²¹. Given the cross-cutting nature of interest in invertebrates (biodiversity, soils, pollination, pest control, etc.), there should be opportunities to stimulate applied research.

6. Threats to endangered invertebrates are generally more acute in southern and eastern Europe

Views of the experts in preparing, e.g. IUCN European Red Lists show that more species are threatened in southern Europe than in north-western Europe and that the annexes of the Habitats Directive are skewed towards north-western species and do not cover all endangered species. There is an historical explanation: at the time of preparing the Habitats Directive there were severe pressures on many western European species, especially from poor water quality. The situation has

²¹ Pillar 2 of Horizon Europe includes the cluster food, bio-economy, natural resources, agriculture and environment. Perhaps the broad threats to European invertebrates could be addressed under this heading.
https://ec.europa.eu/info/horizon-europe-next-research-and-innovation-framework-programme_en

improved significantly: a recent UK study²² found that freshwater species had “undergone a strong recovery since the mid-1990s after two decades of decline”.

The situation, however, has worsened in southern and eastern Europe. The IUCN publication on the status and distribution of dragonflies in the Mediterranean Basin²³, for example, concludes that threatened dragonflies require urgent action to improve their status, regional action is needed and a sustained investment in the conservation and monitoring of species sites and landscapes. These needs could perhaps be addressed with a specific call or focus on the LIFE programme.

The strong link between dragonflies and water quality means that species can be useful bio-indicators of healthy systems. They also have an ability to respond fairly rapidly to habitat improvements, such as seen with the creation of Mediterranean temporary ponds (habitat type 3170*), a typical dragonfly habitat.

As a result of the ex-post evaluation and consultations with experts²⁴, the worrisome status of pearl mussel species in the Mediterranean area has become evident. In Spain, all ten pearl mussel species are threatened with extinction and might disappear in a few years. Moreover, this delicate state is not duly reflected either at national level (national catalogues of endangered species) or at international level (IUCN European Red List).

There are three main threats that adversely affect freshwater molluscs in a combined way:

- Infrastructures (e.g. large and small dams, dykes, embankments, etc.) are physical barriers for the movement of species, leading to fragmentation which also severely reduces the presence of host-fish species for pearl mussels (e.g. *Salmo trutta*), essential for the reproduction process since the parasitic larvae of the mussels (glochidia) must develop on the gills of host fish.
- Water abstraction for irrigation without maintaining minimum ecological flows necessary for the survival of many species (especially pearl mussels).
- Invasive alien species negatively affect freshwater molluscs: by displacing host-fish species for pearl mussels and by altering the ecological conditions of the water (physical and chemical features) affecting freshwater molluscs.

Additionally, water pollution and quality (pesticide runoff from agriculture, sewage, etc.) and changes in water regimes due to climate change (less rainfall and increased frequency and intensity of droughts or sudden floods) are posing additional pressures on these species, although their impact is not well known.

Terrestrial molluscs are not well represented in LIFE projects yet are also highly threatened in the Mediterranean region. The main threats for these species (snails, slugs) are changes in land use (including loss through urban development in coastal areas) and changes in land management practice (agricultural intensification, extension of greenhouse crops, changes in forest management). The main problem is habitat loss and fragmentation, which are particular threats given the limited dispersal capacity of these species.

²² Outhwaite, C.L., Gregory, R.D., Chandler, R.E. et al. Complex long-term biodiversity change among invertebrates, bryophytes and lichens. *Nat Ecol Evol* (2020). <https://doi.org/10.1038/s41559-020-1111-z>

²³ Riservato, E. et al. (2009). The Status and Distribution of Dragonflies in the Mediterranean Basin. IUCN.

²⁴ Rafael Araujo, Researcher at the Natural History Museum - Spanish National Research Council (CSIC) and Benjamín Gómez, Researcher and Professor at the University of the Basque Country - Vitoria, both experts on freshwater molluscs.

According to the latest IUCN assessment (2018), one-third of Mediterranean saproxylic beetles are at risk of extinction as a result of forest decline. But information on these species is very limited: 41% of the species are assessed as Data Deficient. The main threats are intensive forest management leading to habitat loss, urbanisation and tourism development leading to irreversible destruction of habitats in coastal areas, and climate change.

Climate change is posing additional pressure on all invertebrates, and especially in the Mediterranean area. Although forest fires have always naturally occurred in this area, the increase in the frequency and intensity of wildfires as a result of climate change is posing a particular threat to invertebrates, since the capacity of recovery of the destroyed vegetation and soil cover is being severely reduced. Likewise, the decrease in rainfall and the lengthening of drought periods may exceed the capacity of species to withstand these events. Additionally, the restricted distribution area of some species (e.g. mountain areas, Mediterranean and Macaronesian islands) and the low dispersal capacity of many taxa could exacerbate this problem.

7. The difficulties in relating project-level data to regional and national data and Article 17 reporting

The general lack of information about invertebrates, the complexity of their life cycles, and the lack of standardised approaches to monitoring makes it very difficult to compare data from different sources. For example, according to the beneficiary of the endangered arthropods of Extremadura project (LIFE03 NAT/E/000057), the results obtained cannot be easily transformed into units comparable with other references (e.g. reporting for Article 17 or the end-of-project data at national level presented in the *National Atlas and Red Book of Threatened Invertebrates of Spain* (2009-2011)). In the case of dragonflies, the area covered by a population differs widely among species: large species, e.g. the splendid cruiser *Macromia splendens*, have good dispersal availability and therefore, once a citation is made, the population can be considered to be present in the whole relevant valley (with mountain ranges as natural barriers); while for other species with a more limited dispersion, e.g. southern damselfly *Coenagrion mercuriale* for which adults do not move more than 8-10 m, each citation/locality can be considered to correspond to a single population. Consequently, the representation of the localities in a grid (e.g. of 1x1 km cells) does not accurately reflect population sizes either. The beneficiary considers that the use of 'populations' is the most accurate one from a scientific point of view. However, as a result of its use, the outcome of the project was not easily comparable with other sources. It was not possible to get the project results translated into 1x1 km (or even 10x10 km) cells. Additionally, in spite of a large sampling effort, it was not possible to estimate the number of individuals (either larvae or nymphs) per population.

Nevertheless, even acknowledging monitoring difficulties for certain invertebrate groups, the use of a monitoring methodology according to scientific international standards should be a requisite for all projects in order to allow comparison of the outcomes with other projects at European level. For example, in the case of pearl mussels, the European Committee for Standardization (CEN) published in 2017 a standard to provide guidance on methods for monitoring freshwater pearl mussel populations and the environmental characteristics important for maintaining populations in favourable condition.²⁵

²⁵ (CEN - EN 16859: [https://standards.cen.eu/dyn/www/f?p=204:110:0:::FSP_PROJECT,FSP_ORG_ID:40318,6211&cs=100A2B867ABE8FCD88C373A69F77D4079; https://www.sis.se/api/document/preview/8025120/](https://standards.cen.eu/dyn/www/f?p=204:110:0:::FSP_PROJECT,FSP_ORG_ID:40318,6211&cs=100A2B867ABE8FCD88C373A69F77D4079;https://www.sis.se/api/document/preview/8025120/)).

8. Annex II and Annex IV species might not be the best indicator of habitat quality

Annex II or Annex IV species do not always represent the best indicators of good health of the ecosystems. As IUCN reports show, the selection of invertebrates in the Habitats Directive has a value in drawing attention to the needs of species groups and their habitats, and in drawing in funding, but there may be other species more threatened. In the case of the Italian project Lomellina (LIFE03 NAT/IT/000109), while the presence of Natura 2000 species is stable, spotted darter *Sympetrum depressiculum*, a dragonfly not in the Habitats Directive, has disappeared. It is the only species in the project area considered Vulnerable in the IUCN Red List and Endangered in the IUCN Italian Red List. The species was found only after works carried out by the project to restore the hydraulic network. It was one of the most common species until the 1990s, with thousands of individuals flying over the rice crops. But when, from the 1990s, dry cultivation of rice was introduced, the species started to disappear. So, better than the Natura 2000 species of dragonfly, *Sympetrum depressiculum* can be considered the real bio-indicator of the quality of the ecosystem.

9. The role of Species Action Plans

There are few examples of statutory conservation plans for invertebrates and, indeed, very few EU Species Action Plans. One example is the Species Action Plan for the Danube clouded yellow *Colias myrmidone* (2012)²⁶, a species now restricted to Poland, Romania and Slovakia and included in the Butterflies CZ-SK project. The preface to the plan states that “*Species Action Plans answer the acute risk of extinction of a species and represent one of the last chances of conservation when simpler solutions fail. The implementation of action plans is a great challenge for conservation biologists, as effective saving of a threatened species is based on fast, well-coordinated removal of threatening factors, most often large-scale, and complex unfavourable changes in the environment of the species concerned. This is the case of the Danube clouded yellow, one of the fastest-disappearing European butterfly species.*” As traditional land use declined the species rapidly declined and the Species Action Plan was supported by the European Commission in an effort to avert the extinction of the species in the EU. The Butterflies CZ-SK reported that the population of *Colias myrmidone* was still very low with only a few sites in Slovakia with a few individuals.

The act of preparing a Species Action Plan ensures that the best available knowledge from across the species’ range is brought together. However, it is surprising that the plan has not yet led to a LIFE project focused on the Danube clouded yellow. It has only been targeted in three projects Zahorie Sands LIFE06 NAT/SK/000115 and the ongoing project LIFE for Insects LIFE16 NAT/CZ/000731 a continuation of the Butterflies CZ-SK project. But none of these projects put the Danube clouded yellow centre stage. A next-step action would surely be to assess progress with the Species Action Plan based on the Article 17 reporting, specific references in Prioritised Action Frameworks and assessment of the success of measures for the species including agri-environment measures. The Species Action Plan (2012) recommends that the reintroduction of the species should be considered in all countries and regions where it has become extinct in recent years, provided that sufficient habitat is restored.

Species Action Plans may help to bring together expert knowledge and agree on suitable measures for conservation actions but also need to be adopted and put into practice by Member States at regional or international level, e.g. through the Natura 2000 biogeographical process.

²⁶ https://ec.europa.eu/environment/nature/conservation/species/action_plans/pdf/EUSAP_Colias_myrmidone.pdf
Marhouli, P. and Olek, M. (2012) *Action Plan for the Conservation of the Danube Clouded Yellow Colias myrmidone in the European Union*. EU Species Action Plan, European Commission, Brussels.

10. Making best use of existing best practice and advice to landowners

Collectively across LIFE projects, EU agri-environment initiatives, EU management models for Annex I habitats, IUCN initiatives, handbooks and new EU Habitat Action Plans there is a wealth of knowledge available. The challenge is ensuring that this knowledge is not lost, that it is updated and that it is shared.

Many projects in the current selection have achieved success through talking to farmers and landowners, raising their awareness about the threats to species and helping them develop actions which achieve good results. In all cases, farmers appear to be willing to help butterfly conservation. However, these examples have to be set against the wider decline in grassland butterflies across Europe. The challenge then is how to use LIFE experience to step up actions supported by the CAP and Rural Development Programmes. Again, there is a need to mainstream the lessons from LIFE into national programmes, first for the species habitat types, e.g. 6210 semi-natural dry grasslands, but also to the wider countryside. Projects have shown that a patches and corridors approach can work for many butterfly species. The EU Sustainable Farming and Wildlife Initiative (2006-2008)²⁷ included specific advice on habitat requirements and farming practices for species including the large blue butterfly *Maculinea arion*. Similarly, eight of the EU management models for Annex I habitats published in 2008 cover grassland habitats, including 6210 semi-natural dry grasslands²⁸, with practical advice on grazing, mowing, habitat creation, etc.

There is a need for good, simple guidance on species for conservation advisers, farmers and landowners tailored to regional situations and fitting in with agri-environment prescriptions. Several projects in this study helped to develop new agri-environment prescriptions which put species first.

Where agri-environment measures are put in place specifically to support habitats for species there should be some ex-post monitoring of success at Member State level to find out if the prescriptions really did work. If so, then the good practice can perhaps be replicated in other Member States through mechanisms such as the Natura 2000 biogeographical process.

Given the close interrelationship between farming and invertebrates, new opportunities should be explored to jointly address invertebrate conservation and development of economic sectors in a sustainable way.

11. Should co-financing be higher?

A comment was made by the coordinating beneficiary of the arthropods of Extremadura project that it is difficult to sell ideas for projects focusing on invertebrates to decision makers with the 50% EU co-financing rate. All except two projects in the current selection were co-financed at 50%. The exceptions were 75% for LIFE09 NAT/IT/000118 RICOPRI for its focus on priority grassland habitats and LIFE09 NAT/LV/000240 Eremita Meadows for its focus on the priority beetle species *Osmoderma eremita*.

In the majority of EU states, but especially in Mediterranean countries, most experts on invertebrates work independently or for small institutions (small-size enterprises, NGOs) and they cannot afford to co-finance a LIFE project. Substantially increasing the percentage of EC co-funding

²⁷ https://ec.europa.eu/environment/nature/natura2000/management/docs/species_report.pdf

²⁸ https://ec.europa.eu/environment/nature/natura2000/management/habitats/pdf/6210_Seminatural_dry_grasslands.pdf

for projects fully focused on invertebrates and their habitats (80% is suggested) could be an effective mechanism to attract a higher number of applications from this group. Alternatively, LIFE Integrated Projects allow small grants to be paid to experts on actions linked to national or regional Prioritised Action Frameworks.

Discussions at the *Future of the LIFE Programme* conference even suggested a more flexible approach in terms of promoting small grants (with 100% co-funding) where these can be cost effective and, in some cases, offering up to 100% LIFE co-financing rates.

12. Specific issues arising from assessment of Mediterranean projects

Seven projects concerning invertebrates in the Mediterranean area were assessed: three from Spain, three from Italy and one from Cyprus. These were dealing with saproxylic beetles (Cyprus, Italy and Spain), dragonflies and butterflies (Spain and Italy), moths (Cyprus and Italy), a crayfish (Italy) and a pearl mussel species (Spain). In short, the main gaps detected and issues hindering the achievement of the project objectives were the following:

- A lack of knowledge base about the targeted species is one of the major shortcomings in the Mediterranean area. The scarcity of data on distribution, abundance and population trends is a factor strongly limiting the development of appropriate actions for the different taxa.
- Inadequate design and implementation of the monitoring programme during the project. This gap was detected in five out of seven projects, namely, Artrópodos Extremadura (LIFE03 NAT/E/000057), Campanarios de Azaba (LIFE07 NAT/ES/000762), RARITY (LIFE10 NAT/IT/000239), Lomellina (LIFE03 NAT/IT/000109) and RICOPRI (LIFE09 NAT/IT/000118), which made it impossible to assess the real impact of the project on the invertebrate species and then the effectiveness of the actions implemented is uncertain or unknown. The main flaws detected were:
 - a) The lack of ex-ante monitoring
 - b) The use of a methodology not fully according to international standards
 - c) Article 17 reporting requirements not taken into account
 - d) Projects targeting habitats for invertebrates did not monitor invertebrates because it was presumed that habitat improvement would automatically improve the conservation status of invertebrates. However, this assumption was not always correct so the real impact of the project actions on invertebrates was unknown.
- Lack of interest from public authorities at all levels (national, regional, local) for the conservation of invertebrates. This led in some cases to failure in legally endorsing the conservation/management plans as initially planned (e.g. LIFE Margarita Sanabria - ES, LIFE Lomellina - IT). In some cases, only the personal interest of a civil servant can mean the difference between success and failure, such as in LIFE Margarita Sanabria. This is a relevant issue that is severely limiting the update of the conservation status of the species (in national catalogues, IUCN Red Lists) and leading to inaction.
- Shortage of funds after the end of the project putting at risk the continuity of actions and sustainability of the outcomes. This is a key issue, especially for those actions requiring a long time for delivering results (i.e. captive breeding - reinforcement of populations, IAS control). Then, the lack of funding after the project end leads to a waste of the investment. Moreover, as a result of this gap, monitoring invertebrate populations after the project end was not carried

out in most of the projects assessed, which disrupts the sequence of data and does not allow following of population trends.

- Under the actual circumstances (lack of knowledge base, relevance of the problems addressed and monitoring needs), the common duration of the projects (3-4 years) is insufficient to carry out a project on invertebrates with a guarantee of success. This issue especially affected the projects Margarita Sanabria - ES and RARITY - IT which were dealing with captive breeding - reinforcement of populations (both projects) and with invasive species (the latter one).

Generally speaking, it can be concluded that the relevance of the LIFE projects evaluated and their impact on the conservation status of invertebrates was quite low. Having said that, some interesting results were delivered, mainly related to the good results on captivity breeding for the white-clawed crayfish in Italy (LIFE RARITY), the approval of conservation plans for Odonates in the Extremadura Region (the first plans adopted in Spain for this group) and measures for promoting Odonates within nature tourism by the Government of Extremadura (both, LIFE Artrópodos Extremadura).

Recommendations

These are presented in two parts. First, some conclusions and recommendations based on the contribution that the LIFE programme has made to the conservation of endangered invertebrates in Europe, raising some more difficult issues which may need to be addressed to effect a 'step change' in efforts to meet the targets set out in the EU Biodiversity Strategy. Second, a series of recommendations combining the outputs of the 2018 LIFE Platform Meeting on invertebrates with the findings of the ex-post study. These look at more immediate issues for the LIFE programme, some easily adopted and others perhaps requiring more discussion.

Conclusions and recommendations from the LIFE programme

The LIFE programme can help to address the issues affecting the loss of biodiversity, and can test, develop and communicate solutions, but it does not have the resources to deliver the landscape-scale results that are necessary to halt the loss of biodiversity across Europe. The range of projects featured in this analysis show how both a species-focused and habitat-focused approach can achieve similar results but, without sustained programmes of work (matched by a level of monitoring to measure progress), it will be difficult to achieve real impact at the whole habitat level.

A number of endangered invertebrate species are listed in the Habitats Directive and LIFE projects have shown that they can respond to actions to protect and improve their habitats. But what is less targeted is the essential role of invertebrates in every habitat, creating soils, supporting forest, grassland and wetland ecosystems, pollinating wildflowers and crops, providing food for birds and other animals and, ultimately, supporting human life. The hierarchical way that species are listed in taxonomy places invertebrates below most groups which does not give due recognition to their crucial role in supporting life.

Through tools such as the Common Agricultural Policy and the awareness created through the EU Pollinators Initiative, the message from LIFE must be that, if we are to protect the biodiversity and abundance of invertebrates, concerns for these species must be mainstreamed into agri-environment schemes and other positive mechanisms.

Outside the LIFE programme itself the following measures could be considered:

- New opportunities should be explored: for example, a 'cross-over' fund between DG Environment and other DGs (e.g. DG AGRI, DG CLIMA) to jointly address the interactions between nature conservation and economic sectors (agriculture and pollinators, forest management and saproxylic beetles, river basin management and pearl mussels, etc.). It is known that ecological measures in the operational programmes of other funds (e.g. European Agricultural Fund for Rural Development - EAFRD) are not seen as a priority by applicants to those funds (farmers) so an option which genuinely combines both interests might be good for economic profitability and nature.
- Perhaps through the DG Environment Co-ordination Group for Biodiversity and Nature setting up a working group on invertebrates with ministry representatives of the 27 EU countries, in order to identify priority invertebrate species for the Member States (based on scientific criteria), and to develop a road map, at EU, biogeographical region and Member State level, with defined priority actions and a timetable.

- The actual suitability of the Natura 2000 sites for invertebrate species in the Mediterranean area could be re-assessed. During the consultations for this report, the suitability of the current Natura 2000 sites for the protection of butterflies was questioned²⁹. As a result of research carried out in Cyprus and Greece on the effects of climate change and habitat loss for butterflies in Natura 2000 sites, it was found that the Natura 2000 sites did not hold suitable habitats for the butterfly species declared, while numerous hot-spot areas for butterflies were not within Natura 2000 sites (Wilson, R. pers. comm.). In the same way, the low value of Natura 2000 sites for the conservation of terrestrial molluscs, because of the lack of habitat management measures for these taxa, was highlighted³⁰. In this case, the creation of micro-reserves, with management measures for the target invertebrates, could help improve their conservation status. However, measures should be applied to avoid the “pull factor” for collectors, which could be detrimental for some species (e.g. the snail *Iberus gualtieranus*).

Strategic issues for the LIFE programme and other programmes include:

- The fact that numerous experts on invertebrates work independently or for small institutions (small-size enterprises, NGOs) prevents them from applying for LIFE grants since they cannot afford to co-finance a LIFE project. Substantially increasing the percentage of EC co-funding for projects fully focused on invertebrates and their habitats (e.g. 80%) could be an effective mechanism to attract a higher number of applications from this group.
- Developing strategic conservation planning and considering actions in the long term could be more valuable than implementing short-term (4 years) and isolated projects that do not guarantee the sustainability of the actions after the project end. In this sense, two different actions could be taken:
 - To encourage traditional LIFE projects to have a longer duration (e.g. 6 years minimum) to overcome the knowledge gap for most invertebrate species and for monitoring to assess the impact of project actions.
 - To improve the attention given to invertebrates in Integrated Projects for Nature and in the forthcoming Strategic Nature Projects (SNaPs). The broad scope of these projects, addressing national and regional priorities in PAFs, lends itself well to considering actions for endangered species, habitat restoration at landscape scale and support for citizen engagement, capacity building, use of experts and grants to small NGOs to carry out surveys. Establishing a national butterfly monitoring scheme where there is none, or setting up and developing a national action plan for pearl mussels, could be examples of appropriate actions for IPs. The IP/SNaP with its focus on complementary funding is also the ideal vehicle to engage with the CAP and RDPs.

Specific recommendations for the LIFE programme

The 2018 LIFE Platform Meeting on invertebrates produced a summary for policy makers with recommendations on how to increase the focus on invertebrates at project development and proposal stage, in the project itself and through communication. The summary messages are included as Annex 1 of this report.

²⁹ Wilson, R.J. pers. comm. Butterfly expert - Researcher at the Spanish National Research Council (CSIC)

³⁰ Gómez B. pers. comm. Terrestrial molluscs expert - Researcher and Professor at the University of the Basque Country - Vitoria (Spain)

The general messages from the 2018 platform meeting were:

- It is important to get 'species' back into the heart of LIFE Nature projects
- Invertebrate specialists often belong to small organisations: LIFE is seen as too risky
- Assessment of habitat quality should include invertebrate monitoring

For project opportunities the 2018 platform meeting included the following points:

- Focus on habitat quality for species and on habitat connectivity
- Improve public perception of invertebrates and their role (e.g. pollination)
- Include invertebrates as indicator species in habitat projects
- Include species specialists on Steering Groups
- Citizen science projects offer an opportunity to engage people while increasing knowledge
- Raise awareness of other strands in the LIFE programme which could benefit invertebrates
- The EU Pollinators Initiative is an opportunity for LIFE projects to focus on pollinators
- Projects could focus on functional groups such as pollinators/recyclers
- Projects could include actions to increase invertebrate abundance, e.g. as food for birds
- Communication actions should make invertebrates more attractive to the wider public

Adding to these messages, the **conclusions of the ex-post evaluation** give a number of specific recommendations supported by the evidence from the study:

- Recognise invertebrates as a key aspect of all habitat restoration projects
- Understand the difficulties in monitoring individual species and the need for long datasets
- Develop closer links to Habitat Action Plans as these are rolled out
- Continue to focus effort on conservation of European grassland habitats and to include aspects of invertebrate conservation in all projects
- Adopt a Species Action Plan approach at biogeographical level
- Make it easier for projects to include actions for invertebrates including surveys, training of experts, citizen science and small contracts with expert groups

Outside the immediate scope of the evaluated projects are perceived gaps in the current LIFE programme which could:

- Support more projects addressing invertebrate biodiversity, pollinator services, soil processes, etc
- Introduce a bonus score for projects with significant expected impact on invertebrates
- Consider more strategic and longer projects addressing invertebrates, including projects addressing a high proportion of any species and meta-projects
- Invite applications which consider groups of invertebrates with similar ecological requirements, with a focus on 'umbrella species', but considering measures suitable for a range of species
- Address the endangered status of freshwater molluscs by promoting projects dealing with this group
- Support more projects outside LIFE Nature and Biodiversity which address threats to invertebrate biodiversity, e.g. water quality, pesticide control, soil conservation, agricultural and forestry practice (e.g. LIFE HelpSoil LIFE12 ENV/IT/000578 and LIFE REFOREST LIFE17 ENV/ES/000248)
- Consider how invertebrates may adapt to climate change and the importance of connectivity through corridors and steppingstones, including micro-reserves

- Encourage the development of nature tourism linked to invertebrates, bringing socioeconomic benefits to local populations
- Ensure that ex-ante, project, final and ex-post monitoring is included in the project design

Annex 1

BRINGING BUGS BACK TO LIFE: action for threatened invertebrates
LIFE Platform Meeting on invertebrates
18th-19th September 2018, STEP Scotland Business Enterprise, Stirling, Scotland

Summary for policy makers

General Messages

- Our delegates felt it was important to get ‘species’ back into the heart of LIFE Nature projects; there was a general agreement that the proposals (and therefore the evaluation process) focussed too much on externalities such as ecosystem services and green procurement.
- Invertebrate specialists often belong to small organisations or are individuals. They see LIFE as too risky as they are too small to provide the match funding.
- Assessment of habitat quality should also have a component of invertebrate monitoring, either using indicator species or functional groups and not just plant assemblages.

Project Opportunities

- Invertebrate projects should focus on habitat quality for the targeted species and on habitat connectivity in specific cases. In addition, these projects should always focus on improving public perception of invertebrates and communicate the importance of invertebrates for biodiversity and in terms of their functional role (e.g. pollination).
- Encourage habitat-based projects to include invertebrates, possibly as indicator species, ‘*intelligent proxies*’, to show short-term gains and long-term monitoring. Habitat-based projects often provide benefits to invertebrates (not necessarily in the short term) so we should find ways to improve how we report invertebrate content in all our LIFE projects.
- Encourage projects to include species specialists on project Steering Groups to ensure there is a voice to champion species interests, particularly for taxa easily ignored such as invertebrates and lower plants.
- Citizen science-focused projects offer a good opportunity to engage more stakeholders in invertebrate conservation, while increasing the knowledge on invertebrate distribution and habitat at the same time.
- The LIFE programme and national focus points should raise awareness of other available strands in the LIFE programme which could also benefit invertebrate conservation, such as GIE projects relating to awareness-raising campaigns regarding the important role of invertebrates.
- The EU Pollinators Initiative represents an important opportunity for future LIFE projects to focus on pollinators as a theme. This could be included in the Multiannual Work Programme (MAWP). Is there a possible role for the Council of Europe’s European Strategy for Conservation of Invertebrates?
- Projects should move away from focusing on a key species towards functional groups. For example:
 - Pollinators/recyclers – this would also link across to other LIFE strands more effectively and lends itself to popularisation and better public awareness of invertebrates as enablers.
 - Many LIFE Nature projects targeting habitat types or area-measures for species could include specific actions targeted towards management for invertebrate habitats to increase abundance and diversity. An ‘*umbrella approach*’ to add value and link invertebrates to key messages that the public can buy into more easily, i.e. promoting invertebrates as a food source for birds.

- Communication is key to supporting invertebrates as essential enablers, but dissemination actions can be an afterthought in the development of projects. The discussion focused around how to make invertebrate conservation more attractive to the wider public. Shared examples included an art exhibition of up-close invertebrate photography, wider use of common names, and development of apps (like Pokemon GO for invertebrates).

Improving Communication

- Generally poor awareness that EU Red-listed species can also receive funding – participants also unaware that there was an EU Red List for Habitats.
- National agencies and LIFE programme to better align funding objectives to increase match funding possibilities to provide opportunities for smaller organisations/individuals.
- National agencies to actively promote species of conservation concern.
- National Contact Points (NCPs) – could they do more? Existing and, more importantly, potential LIFE beneficiaries should get a lot of their information from the NCPs. The fact that there are no Red List species in the portfolio, despite inclusion in the programme, suggests that some messages are not getting through. Maybe include more information at the LIFE Info Days and make sure critical gaps are covered and include some of the recommendations from this platform meeting.
- Case studies – it would be helpful to have access to some case studies on the LIFE website to show that LIFE Environment, Climate Change and perhaps Solidarity Corps projects could provide a good platform for invertebrate projects.

Project Development/Proposal Stage

- Encourage involvement of invertebrate specialists at project design stage.
- Better advertise proposal writing support workshops/info days and flexibility within LIFE.
- Improve the interaction and communication between the LIFE programme and potential project developers.
- Development of guidance/checklist linking habitats to specific species (listed on the annexes or listed as threatened on the Red List) that need to be considered where a project has an impact on a habitat type.
- Development of additional tools/tips (or through capacity building workshops) for engaging with landowners during/beyond the project regarding invertebrate conservation.
- Increase the profile of invertebrates in the Multiannual Work Programme, or in the application guide – reduce emphasis on peripheral things (e.g. green procurement) and increase emphasis on invertebrates and other species groups that are under-represented in the programme.

Incentives

- Include an incentive/bonus in the evaluation marking scheme to favour invertebrates, especially in habitat-based LIFE Nature projects – more marks if the beneficiary can demonstrate they have consulted an expert group.
- Projects should get 75% funding if targeting an invertebrate species on Annex II.
- A suggestion that threatened species on EU Red Lists should attract the same level of funding as priority species listed on the Annex II of the Habitats Directive as this would stimulate more applications for invertebrate-focused proposals and assist those smaller organisations to apply for LIFE funding.

Resource Gaps

- Collaboration will be key to retain specialist ID skills and to train new experts.
- Acknowledge that there are insufficient experts and groups to be involved in many projects. Establish a support network of experts to provide advice on invertebrates that could be vulnerable or important within a habitat-based project. For example, if your project is a bog project in southern Europe you could contact the expert and request advice on appropriate methods to include for invertebrate conservation.
- There is a clear opportunity for a LIFE Information Project (GIE) focused on invertebrates. There is much information available from previous projects, but it is not being disseminated effectively or communicated to the wider public. There is an opportunity for a project to bring this learning together.
- Could we have invertebrate LIFE Preparatory (PRE) projects?
- Could invertebrates be included more widely in LIFE Integrated Projects (IP) or under a small grants component? Projects focussing on threatened invertebrates are often small and unlikely to require large amounts of funding. One project could cover many smaller initiatives by distributing small amounts of funding to deliver targeted projects on priority species throughout Europe.
- Specialists with expertise in field identification could be brought together to share skills and pass on knowledge – there was a general feeling that skills are being lost.

Sustainability Considerations

- Improve how LIFE acknowledges the role of farmers/landowners in projects to boost engagement and instil pride.
- Improve and implement after-LIFE plans.
- Use invertebrate indices to evaluate Rural Development Programmes in order to focus more attention on invertebrate groups.

Annex 2

Project case studies - extracted from project summaries

LIFE06 NAT/F/000142	An example of LIFE as a tool for capacity building
LIFE03 NAT/E/000057	Conservation plans for invertebrates in Extremadura
LIFE03 NAT/E/000051	Despite best efforts the conservation status of a species remains highly threatened
LIFE07 NAT/E/000762	It is impossible to measure success without monitoring
LIFE08 NAT/D/000002	Improving the conservation status of dragonfly species - but a need to consider habitat for both larvae and adults
LIFE06 NAT/AT/000124	Conserving butterflies of fen meadows in Austria
LIFE10 NAT/DE/000005	Meadow management for butterflies in Germany: establishing the role of 'meadow managers'
LIFE09 NAT/IT/000118	Focus on restoration of priority grassland habitat in Italy
LIFE03 NAT/IT/000109	Land use changes threaten rare dragonflies
LIFE05 NAT/DK/000151	Successful start of recovery of populations of marsh fritillary butterfly in Denmark
LIFE09 NAT/CY/000247	Focus on long-term recovery plans for rare invertebrates in Cyprus
LIFE08 NAT/FIN/000596	Landscape-scale projects are expected to have a positive impact on invertebrates
LIFE08 NAT/PL/000513	Sustainability is necessary in European grassland management
LIFE09 NAT/LV/000240	Invertebrate species are highly dependent on habitat quality
LIFE03 NAT/B/000019	The value of a meta-project with a long-term vision
LIFE04 NAT/BE/000010	Habitat management supports biodiversity
LIFE10 NAT/IT/000239	Invasive species projects must be continued to completion
LIFE06 NAT/PL/000100	Improving habitats for butterfly species does not always lead to expected results in terms of recovering populations
LIFE09 NAT/PL/000259	Achieving favourable conservation status for habitats expected to benefit associated invertebrates
LIFE09 NAT/CZ/000364	Replication of project best practice is important to increase impact

1. An example of LIFE as a tool for capacity building

The project 'Lauter-Donon' in France (LIFE06 NAT/F/000142), coordinated by the Office National des Forêts (National Forest Office), aimed at improving the conservation status of four Natura 2000 sites in the Lower Lauter Valley (2,000 ha) and three sites in the Vosges mountain range (7,000 ha). The areas had a high proportion of land occupied by public forests, but also had been lacking proper nature conservation management, resulting in the decline of several protected species. The Lauter Valley sites include well-preserved wet meadows and flood forests, favouring several alluvial habitats and species. The Vosges sites include active raised bogs and bog woodlands. The project addressed a number of species including, in the Lauter Valley, the green snaketail dragonfly *Ophiogomphus cecilia*, the dusky large blue butterfly *Maculinea nausithous* and the large copper butterfly *Lycaena dispar*.

The project was not intended to deliver large-scale restoration works but rather to establish the mechanism for long-term management through the transfer of management duties from the National Forest Office to local administrations. After the project, the municipalities were put in charge of Natura 2000 site management, creating specific jobs and services. This capacity-building effort boosted stakeholder engagement, by putting in charge public services that were not exclusively focused on commercial forest management, but rather on public interest. Local administrations are in a better position to establish partnerships with nature conservation associations and to carry out awareness-raising activities targeting their respective communities.

In addition to the transfer of management duties, capacity-building efforts include:

- Training forest managers in management practices for protected species
- Training hunters to tackle deer and wild boar overpopulation
- Training volunteers and students in ecological monitoring techniques and protocols

The main benefit of the project is that it was responsible for the creation of an administrative service in charge of Natura 2000 site management, which is a significant contribution to ensuring the continuation of conservation activities.

The invertebrate species targeted were:

- *Ophiogomphus cecilia* (a vulnerable dragonfly in Alsace, although in very good conservation status on the Lauter site and classified as Least Concern in the IUCN European Red List)
- *Lycaena dispar* (rare species in Alsace, in good conservation status)
- *Maculinea nausithous* (rare species in Alsace, in good conservation status)
- *Maculinea teleius* (common species in Alsace, in good conservation status)
- *Euphydryas aurinia* (common species in Alsace, in good conservation status)

These insects of Community interest benefitted directly from forest stream restoration actions; *Ophiogomphus cecilia* is the emblem of the Lauter site. Two butterflies on the 1994 Standard Data Form, *Maculinea teleius* and *Euphydryas aurinia*, were not found during surveys in 2008-2009 at the beginning of the project. Wetland restoration work showed that, for instance, the transplantation of *Sanguisorba officinale* seedlings to attract *Maculinea teleius* was considered successful and was replicated on the same site in 2018.

Unfortunately, complete monitoring datasets are not available for *Maculinea teleius* and *Lycaena dispar*. Additional surveys should have been carried out after the project but the limited resources of

the Conservatory of Alsatian Sites (CSA) were an obstacle to annual data collection. As a result, no follow-up of *Maculinea teleius* populations has been performed.

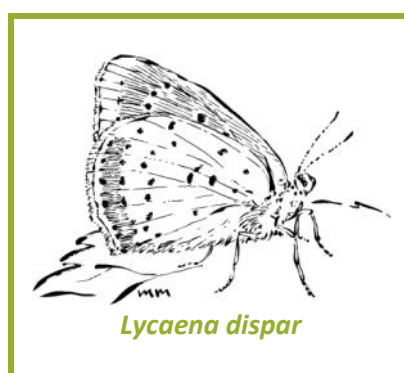
Lycaena dispar was surveyed on a regular basis, although not on the whole 2,000 ha Lauter site. Surveys show that *Lycaena dispar* populations remained stable over the last five years, although habitat connectivity is an ongoing issue that can only be solved by massive investments in wet meadow restoration and maintenance.

Ophiogomphus cecilia populations were followed from 2014 onwards in the framework of the environmental and social impact assessment of a wastewater treatment plant project in the Lauter basin.

In terms of impact on habitats and species, the project improved alluvial habitats and hay meadows in the Lauter Valley to the benefit of the targeted invertebrates. However, as with many projects in this ex-post study, there has been limited funding for continuity post-project and no further monitoring. The scale of the project was too small to influence national habitat and species reporting under Article 17. At national level the conservation status for targeted invertebrates is:

Table 5. Evolution of the national conservation status of targeted species listed in annex of the Habitats Directive
(source: <https://nature-art17.eionet.europa.eu/>)

Group	Species	2005 assessment	2018 assessment	Reason for change	Conclusion of 2018 assessment trend
Arthropods	<i>Lycaena dispar</i>	FV	U1	no change	=
Arthropods	<i>Maculinea nausithous</i>	U2	U2	no change	-
Arthropods	<i>Maculinea teleius</i>	U1	U2	no change	=
Arthropods	<i>Ophiogomphus cecilia</i>	XX	FV	no change	=



2. Conservation plans for invertebrates in Extremadura

The project 'Conservation of endangered arthropods in Extremadura' (LIFE03 NAT/E/000057) focused on four dragonflies, *Coenagrion mercuriale*, *Macromia splendens*, *Oxygastra curtisii* and *Gomphus graslinii*. The project took place on a network of seven Natura 2000 sites covering about 35,500 ha in northern Extremadura. It sought to improve the knowledge base on the status of these species in the region and to implement management measures addressing loss of habitat quality due to water pollution, changes in land use or poor river bank and forest management. Likewise, awareness-raising activity was a very relevant element in the project.

The project increased the knowledge base on the species, especially for dragonflies, allowing the beneficiary to better spot and monitor potentially suitable breeding areas, subsequently included in management plans. Beneficiary staff (a regional authority with full powers in nature conservation) was trained in the identification of the species and their requirements and learnt about the importance of insects.

Management plans were approved for the four dragonfly species in 2008. Since then, the needs of these species are routinely considered in the assessment of the potential effects of any activities or plans on the targeted Natura 2000 sites. Consequently, among many examples provided, some municipalities had to modify the urban planning zoning, recreational activities in rivers (common in the project area) must respect some safeguards, and the control of pests for olive trees was modified with the use of a different pesticide and by enlarging the buffer zone near rivers.

There is no clear updated information on the medium-term impact on the conservation status of the species due to the absence of targeted monitoring activities since the end of the project. Nevertheless, it is considered that the overall improvement in the status of rivers in the project area and the safeguards established in the management plans have led to the conservation status being maintained or improved for dragonflies. The exception is for southern damselfly *Coenagrion mercuriale* which benefits from traditional extensive cattle grazing, but as this has decreased in the last decade there has been an impact on the species.

The project was successful in improving the conservation status of target species, by both significantly increasing the number of populations found and improving knowledge on their requirements. Ditches restored were rapidly colonized by *Coenagrion mercuriale*, allowing this species to increase its area and connecting populations. Riparian reforestation works were successful in some places where habitat was improved for the remaining dragonfly species. Most importantly, the protection system was significantly improved by both inclusion of the populations in the regional GIS and the approval of the management plans, making it mandatory to assess the effect of economic activities upon their status.

A side-product of the project, the book *Odonates of Extremadura*, has increased interest in dragonflies in a region well-known for nature tourism. Extremadura is renowned for bird-watching tourism and dragonflies/damselflies are an interesting additional element helping to diversify this economic activity. At the time of the ex-post, the Regional Ministry of Tourism was actively working on this issue, with presentations at international nature tourism fairs and a field guide under preparation.

The need to have management plans approved within the project duration was highlighted as a positive element in LIFE projects. It ensured that the respective plans were implemented with results continuing until today. The beneficiary pointed out the effort required to get support for projects aimed at invertebrates and other groups with low visibility and little attraction for both the general

public and high-level managers ('politicians'), particularly when they are further penalised by low co-financing thresholds.

Baseline and final population estimates were obtained. Unfortunately, due to lack of funding, there has been no ex-post monitoring.

Table 6. Odonata species: Baseline and final population estimates. Sources: t1 and t2: Final Report of LIFE03 NAT/E/000057; t3: Catálogo Regional de Extremadura de Especies Amenazadas vol. I Fauna (2011) and expert assessment of the project's director and manager

Species	Population in project area before project (t1)	Population in project area at end of project (t2)	Population in project area 12 years after the project's end (t3)
<i>Coenagrion mercuriale</i>	3	41	Not known – possible negative trend
<i>Macromia splendens</i>	3	18	Not known – possible stable trend
<i>Oxygastra curtisii</i>	4	49	Not known – possible stable trend
<i>Gomphus graslini</i>	2	47	Not known – possible positive trend

The results obtained at the end of the project were used in the preparation of the *National Atlas and Red Book of Threatened Invertebrates of Spain* (2009-2011) in which all targeted dragonflies are listed. In it, the vast majority of the information for the region of Extremadura comes from this project's results. Consequently, even though there are no data on trends, a national framework is available for the end-of-project snapshot for the four dragonflies.

Table 7. Regional and national population of Odonata species at the end of the project

Species	Regional population at end of project (t2)		National population at end of project (t2)	
	Localities	10x10 km grid cells	Localities	10x10 km grid cells
<i>Coenagrion mercuriale</i>	32	22	414	298
<i>Macromia splendens</i>	31	16	70	39
<i>Oxygastra curtisii</i>	59	31	186	121
<i>Gomphus graslini</i>	58	31	75	44

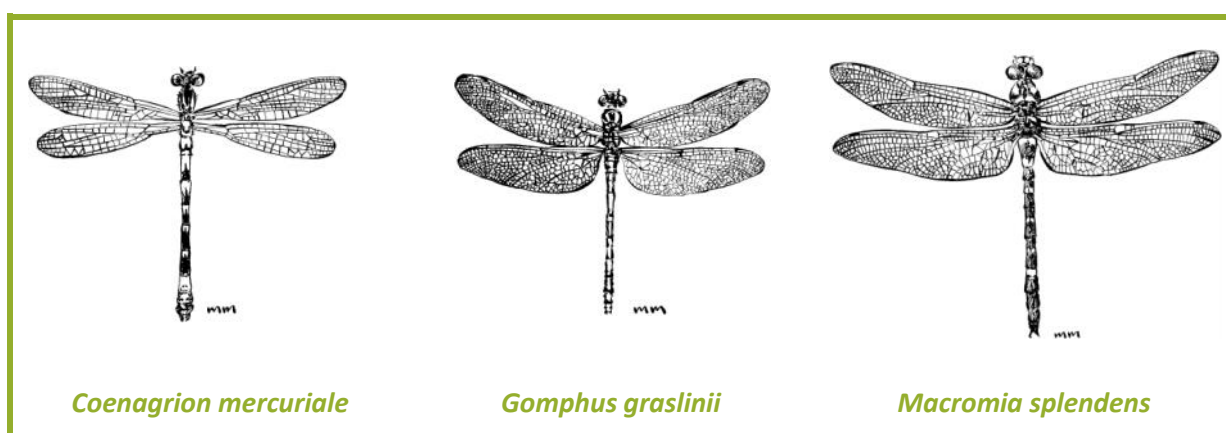
These results raise some issues. Firstly, the figures in the national Atlas and Red Book do not match those provided in the Final Report of the project. Although 'localities' (citations) do not correspond exactly with project 'populations', the differences are larger than that. Secondly, and more relevant, in several cases there seems to be an over-representation of the Extremadura region at the national level, which confirms the scarcity of systematic data about this group of species and, therefore, the skew in the national results as a result of the intensive sampling effort in the project.

Results could potentially also be compared at national scale using the reporting for the target species in the Mediterranean region under Article 17 of the Habitats Directive.

*Table 8. Population comparison between 2007-2012 and 2007-2018. Source: EIONET * In the case of the population data for 2007-2012, the results are presented as localities (with a note clarifying that localities is equal to populations) except in the case of 'Macromia splendens' for which the unit used are colonies.*

Species	Reporting period 2007-2012			Reporting period 2007-2018			
	Population (localities)	Conservation Status	Trend	Population (1x1 km grid cells)	Population (minimum localities)	Conservation Status	Trend
<i>Coenagrion mercuriale</i>	252	U1	Unknown	240-24,000	252	U1	Stable
<i>Macromia splendens</i>	62*	FV		49-4,900	-	U1	Stable
<i>Oxygastra curtisii</i>	162	FV		76 (min.)	162	FV	Stable
<i>Gomphus graslini</i>	89	FV		44-74	80	U1	Negative

The divergences between the National Atlas and Red Book and the reporting under Article 17 are evident. This is caused by the reporting format under Article 17, for which regions (officially known as Autonomous Communities, i.e. authorities with full powers in nature conservation) provide data. The national authority then is responsible simply for compiling these data. This procedure explains why the figures appearing under Article 17 are lower than those in the Atlas – which probably includes other sources not taken into account by some regional ministries.



3. Despite best efforts the conservation status of a species remains highly threatened

The main objectives of the ‘Margarita Sanabria’ project (LIFE03 NAT/E/000051) in north-western Spain were to understand the conservation status of freshwater pearl mussel *Margaritifera margaritifera* (habitat characterisation, determination of host species and threats) and to contribute to the survival of the current populations and the conservation of its habitat in the Castilla y León region. The conservation of the species is also wholly dependent on a healthy population of trout (*Salmo trutta*). In the region, trout is the host fish for pearl mussel larvae (glochidia) which spend several weeks attached to the fish’s gills before dropping to the stream bed as small bivalves.

Although the project was delivered to plan in terms of improved knowledge on the species, its legal protection, the development of management tools and the drafting of an action plan, the species remains highly endangered. The ex-post evaluation found that its precarious conservation status, linked to the habitat quality necessary to ensure its survival and reproduction, the serious problems that climate change is creating and the emergence of other new threats such as invasive species, all in the context of funding shortages for nature conservation, do not leave room for optimism for the future prospects of this species. If no immediate and basin-scale measures are taken, the extinction of the freshwater pearl mussel in the catchment is highly likely within a few decades.

This is an example of a project that, having achieved notable advances in knowledge and legal protection of a species and also tested the management measures that must be adopted, due to a set of foreseeable circumstances (e.g. the very precarious status of the species and the difficulty for its recovery due to very high ecological requirements) and unpredictable ones (from the outbreak of the financial crisis, to the increasing impact of climate change on river ecosystems), has not managed to reverse the decline in conservation status in any way.

Information collected at the ex-post mission confirms the precarious state of the species.

Table 9. ‘Margaritifera margaritifera’. Population parameters

Species		<i>Margaritifera margaritifera</i>				
River:		Negro	Tera	Castro	Bibey	Tuela
Number of alive individuals	Before project	Presence	Presence	Presence	Presence	Presence in the Portuguese part
	Project end	Direct count: 1,893; Total population estimation: 3,000-3,500	Direct count: 38; Total population estimation: 50-	0	4	0
	3 yrs later (2010)	Direct count: 2,482	Direct count: 22	--	--	--
	12 yrs later (2018)	Direct count: 1,174	7	0	0	0
Length of river channel with presence of the species (km)	Before project	Unknown	Unknown	Unknown	Unknown	Unknown
	Project end	27	Unknown	0	0	0
	12 yrs later	19	1.45	0	0	0
Population density	Before project	Unknown	Unknown	Unknown	Unknown	Unknown
	Project end	0.129 id/m2	0.024 id/m2	0	0.002 id/m2	0
	12 yrs later			0	0	0
Number of possible colonies	Before project	Unknown	Unknown	Unknown	Unknown	Unknown
	Project end	30	1	0	0	0
	12 yrs later	Unknown	0	0	0	0

Data sources: Final reports of the LIFE Margarita Sanabria and of the study for the improvement of the population status of *Margaritifera margaritifera* in Castilla y León in 2018 (JCyL) (this latter report includes information on the results of a survey in the Tera river carried out by JCyL in 2010). It should be noted that the results related to the total number of living individuals are not directly comparable among the three censuses carried out (LIFE project, 2010 and 2018), because they used a different methodology.

According to the study in 2018, the following conclusions can be reached:

- The total estimated population in the Negro remains more or less stable, although its distribution range has reduced by 30% (8 km) in the last decade.
- The population in the Tera has reduced by 82%.
- No living individuals were found in the Bibey where the species seems to have disappeared.
- No living individuals were found in the Tuela. Nevertheless, it seems that the species is still present in the Portuguese part of the river.

The presence of young individuals or young adults has not been confirmed in either the Negro or the Tera during sampling despite the fact that individuals are fertile. This demonstrates a lack of reproductive success attributed to two possible facts: the low densities of young trout, and the problems for the survival of the larval stage (glochidia) which are especially sensitive to habitat changes.

The causes are not clear, but could be related to multiple factors such as the loss of refuges for young trout (e.g. abandonment of water mill channels), sedimentation of riverbeds (which make them unsuitable both as breeding areas for the trout and also for the survival of young pearl mussel), the impact of climate change (e.g. increase of water temperatures, increase of frequency of flooding and extreme droughts), inadequate forest management (e.g. after fires), the impact of the invasive signal crayfish *Pacifastacus leniusculus* which predaes on pearl mussel and young trout, etc. Overall, there is an observed reduction in trout density and progressive substitution by cyprinid fish species which cannot act as host to the pearl mussel's larval glochidia stage.

The implementation of a river restoration plan focused on pearl mussel and its host species, the rescue and resettlement of adults after extreme weather events, and the propagation of the species on young trout are urgent measures to be taken before a captive breeding programme can be implemented with sufficient guarantee of success. Otherwise, the extinction of this species in Castilla y León is more than probable within a few decades. It is necessary to address these issues with a dedicated budget that currently does not exist and that, in the current framework, seems unlikely to exist in the medium-long term.

As seen in table 10 below, the main conclusions on species status according to Article 17 reporting for the Mediterranean region in Spain coincides with those from the ex-post mission. This is logical because the vast majority of the population in the Mediterranean Biogeographical Region in Spain is located in the project area (Negro river) and the data sources for the elaboration of the ex-post report are the same used for the elaboration of the report on Article 17.

Table 10. '*Margaritifera margaritifera*': Article 17 reporting – Spain. Mediterranean Biogeographical Region

Variables	2007-2012	2013-2017
Range	U1 Unfavorable-Inadequate	U2 Unfavorable-Bad
Surface area	1,502	4,400
Short-term trend Art. 17 2007-2012 (2000-2010) Art. 17 2013-2017 (2007-2018)	Decreasing (complete survey)	Decreasing (complete survey)
Long-term trend	N/A	1986-2018: Uncertain (estimate expert) (1)
Other		--

Variables	2007-2012	2013-2017
Population	<i>U2 Unfavorable-Bad</i>	<i>U2 Unfavorable-Bad</i>
Population estimations	Period: 2000-2010 12 localities (2)	Period: 2010-2018 Best single value: 69 (1x1 km grids) Add. population size best single value: 132.06 (inhabited km)
Short-term trend Art. 17 2007-2012 (2000-2010) Art. 17 2013-2017 (2007-2018)	Decreasing (estimation)	Decreasing (estimation)
Long-term trend Art. 17 2013-2017 (1994-2018)	N/A	Decreasing (estimation)
Favourable reference population - population size	--	132.06 km (3)
Habitat x spp	<i>U2 Unfavorable-Bad</i>	<i>U1 Unfavorable-Inadequate</i>
Sufficient area and quality of habitat occupied	1,054 km; Bad Quality	Yes
Short-term trend Art. 17 2007-2012 (2000-2010) Art. 17 2013-2017 (2007-2018)	Decreasing	Decreasing
Long-term trend (1994-2018)	N/A	Decreasing
Future prospects	<i>U2 Unfavorable-Bad</i>	<i>U2 Unfavorable-Bad</i>
Overall assessment in conservation status (CS)	<i>U2 Unfavorable-Bad</i>	<i>U2 Unfavorable-Bad</i>
Overall trend in CS	<i>Deteriorating</i>	<i>Deteriorating</i>

NOTES:

- (1) The distribution range in Castilla y León has changed in the period 2013-2017 because of the extinction of some populations and the discovery of some new ones (in the Alberche and Águeda rivers). Hence, range trend is uncertain given the lack of knowledge of the distribution of the species in the region years ago, although it could be assessed as decreasing.
- (2) It is not possible to provide accurate estimates, only minimum population data is provided. There are no data that allow their conversion into number of individuals.
- (3) The favourable population of reference corresponds to the length in linear kilometres in which the populations are distributed, measured by experts.

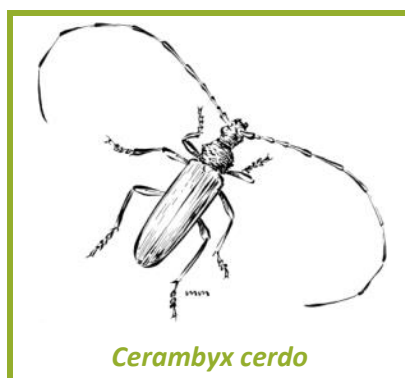


4. It is impossible to measure success without monitoring

The LIFE project 'Campanarios de Azaba' (LIFE07 NAT/E/000762) was a first step towards the initiative of the president of the Fundación Naturaleza y Hombre for an 'Iberian West vision', where the Iberian West covers a large territory (c. 4 million ha) shared by Spain and Portugal. This is a territory with a common culture, history and problems, and covers a number of areas of high ecological value. At present, it suffers from the consequences of agricultural abandonment, management changes linked to the Common Agricultural Policy and climate change. The 'Iberian West vision' aims to revitalise this territory by relying on the conservation of its natural values and traditional uses. The Campanarios de Azaba project was launched with the purchase of a 500 ha. estate of dehesa evergreen oakwoods. The wider project objective was to stimulate an enhancement of biodiversity on c. 133,000 ha of Mediterranean woodlands in Natura 2000 network sites by demonstrating best management practice in the purchased estate. To assess the impact of these measures, a series of biodiversity indicators based on invertebrates was to be developed.

Although the project carried out studies on insect species, including the saproxylic beetle *Cerambyx cerdo* and the marsh fritillary butterfly *Euphydryas aurinia*, there was no follow-up monitoring in the project or its successor LIFE Oeste Ibérico. Studies on saproxylic insect communities confirmed a high diversity of beetles in relation to other Iberian dehesas, in fact, the largest known so far (131 species of 36 families). However, the result lacks any basis for comparison. With respect to saproxylic dipterans, the results indicate a high specific richness and the presence of various rare species, although 70% of the identified individuals correspond to only two species. Together, the results confirmed the importance of the Campanarios de Azaba for some of the most endangered saproxylic insects in Europe. Studies on coprophagous insect communities highlighted a very low diversity in comparison with other Salamanca dehesa meadows, attributed to the intensive livestock practices carried out in the reserve before the project.

With respect to target invertebrate species, the reduction of livestock pressure and the implementation of forest management practices are expected to have a positive effect on communities of saproxylic (including *Cerambyx cerdo*) and coprophagous insects. But there are no data to confirm this. In the case of *Euphydryas aurinia*, no additional works have been carried out to improve its feeding habitat (*Lonicera* sp.). According to the coordinating beneficiary, the main reason has been the lack of means for clearing the vegetation. There is no information on the current status of this species in the reserve. The declaration of the area as an Entomological Reserve implies a commitment to implement conservation measures supervised by Asociación Española de Entomología, thus giving a certain guarantee of sustainability of the actions initiated for invertebrate species. It is essential that the beneficiary resumes monitoring to assess the impact of the projects. For the same reason, it would be equally important to continue monitoring of dragonflies started with the second project to assess in part the impact of conservation actions on habitat *3170 Mediterranean temporary ponds.



5. Improving the conservation status of dragonfly species - but a need to consider habitat for both larvae and adults

The objective of the 'Keiljungfer' project (LIFE08 NAT/D/000002) was to improve the conservation status of the green club-tailed dragonfly *Ophiogomphus cecilia* in Bavaria. Specific objectives were to stabilize existing populations, to reconnect river sections with separated populations and to create suitable habitats for river stretches where the green club-tailed dragonfly used to occur, but where it is currently missing. The project worked on dynamic habitats, which had gradually lost the characteristics important for the target species, due to natural processes of succession.

The project helped improve knowledge on the species and the effectiveness of habitat management work to the extent that required measures for the species are now generally well known. Work continued after the project, although the species was no longer the focus of conservation effort, as its status in the region is now assessed as favourable (in part a direct consequence of the project). Nonetheless, measures which aim to open up the habitat run contrary to the implementation of the Water Framework Directive by the competent water authorities which aims to allow natural succession, e.g. of alluvial woods.

Therefore, although the project has shown an increase in the species, the long-term success is threatened by natural succession. The ex-post visit found that the incentive for continuing management is rather limited since management requires repeated investments, but responsibility rests with the different water authorities who do not necessarily have the conservation of the species as their main focus.

In terms of conservation status, prior to the project the situation for the species was critical. In the 1990s the species was listed in the Red Lists of Bavaria and Germany as threatened by extinction. Since the project the status on the Red List has changed to strongly threatened. The conservation status of the species according to the Article 17 national report 2013 for the Continental region is favourable.

The information gained in the project has to be qualified. The project targeted habitat structures along rivers, which the species uses during the flight season and for mating. Monitoring during the project was limited to adult stages and the effects of implementation of concrete conservation actions. Yearly visual observations were carried out for all river stretches. In years that showed favourable weather conditions, marking of adults was done to gain further insights. All river stretches and other environmental factors were described according to a protocol. Monitoring activities were also described in a separate protocol. While all river stretches were monitored, the estimate of the total population is not possible. Nonetheless, the local populations seem to be stable and rather strong.

The final monitoring report of 2014 concluded that for some sites the conditions for the target species were highly improved, followed by increased numbers of green club-tailed dragonfly. The report called for follow-up management to stop the growth of shading vegetation, taken up by the After-LIFE Conservation Plan, yet due to structuring of responsibilities after the project most of these recurring management measures have not been carried out to date.

In 2014 an additional expert for larvae and its habitats assessed the project's rivers. The report pointed out that structural dynamics are crucial for the larvae of the target species. For some sites the report acknowledged improved and good conditions, but for others it pointed at further needs for the larvae as there are no spaces for larvae development in the sandy or even muddy bed of the rivers.

This was a weaker aspect of design. The creation of larval habitats, due to the length of the larval stage being three or four years, was only addressed indirectly (e.g. gravel insertion, creation of structural diversity in rivers and bypasses).

No monitoring of populations was carried out until the ex-post mission. The weather, especially in 2017 and 2018 during the complete flight season, was very unfavourable. The project manager did check visually all project sites in these years and generally could only find very low numbers of individuals. Marking and recapture of individuals was not feasible. These changes between years are normal for the species and during the ex-post mission many individuals (of course mainly males) could be seen on most project sites, especially those already identified in the monitoring reports as optimal. Nonetheless, future development is difficult to foresee, as structural developments and habitat conditions are not always favourable (e.g. increased shading, loss of river dynamic).

6. Conserving butterflies of fen meadows in Austria

The aim of the 'Untersberg-Vorland' project (LIFE06 NAT/AT/000124) in the Austrian state of Salzburg was improvement of habitats for highly endangered butterfly species, especially the scarce fritillary *Euphydryas maturna*. Implementation of actions with landowners for preservation of the hay meadow landscape of the Untersberg Mountain would achieve this aim. *Euphydryas maturna* is the most endangered flagship species of the project site which hosts one of largest remaining meta-populations in Central Europe. Other species benefitting from the actions include Annex II species marsh fritillary (*Euphydryas aurinia*), scarce large blue (*Phengaris (Maculinea) teleius*), yellow-bellied toad (*Bombina variegata*) and fen orchid (*Liparis loeselii*), and Annex IV butterfly species woodland brown (*Lopinga achine*). Particular attention was paid to the restoration and management of *Molinia* meadows (6410) and alkaline fens (7230) that serve as habitats for the above species. Concrete conservation measures were accompanied by a numerous awareness-raising and dissemination activities.

Although ex-post visits aim to collect information to show the pre-project situation, end of project results and 5 years+ after project monitoring results, providing information on species using solely this approach is only meaningful for species with population growth trajectories not affected by substantial fluctuations. For species with substantial fluctuations in abundance and distribution range, more detailed data than t1, t2 and t3 are required for the assessment of their conservation status:

Table 11. Population parameters of different species

Species	Population in project area before project (t1, baseline survey 2007)	Population in project area at end of project (t2, monitoring 2010)	Population in project area 5+ years after project (t3, ex-post survey, non-standardised)
<i>Euphydryas maturna</i> - imagines	19	2	28
<i>Euphydryas maturna</i> – imagines – larval nests	171	28	6
<i>Euphydryas aurinia</i>	118	314	49
<i>Phengaris (Maculinea) teleius</i>	34	12	4
<i>Lopinga achine</i>	9	0	(12)*

* Observation on meadows just adjacent to the project area

These detailed data refer to the Natura 2000 site AT3227000 Untersberg Vorland. They exist thanks to the LIFE project. Quantitative data over the same dates on national populations were not available to the monitoring expert in time for the completion of the ex-post report.

Table 12. Monitoring of 'Euphydryas maturna': Number of imagines and larval nests (2007-2019)

Year	Imagines	Larval nests
2007	19	171
2008	35	82
2010	2	28
2012	1	7
2019	28	6

The permanently decreasing number of larval nests is alarming. On the other hand, the species is very sensitive to extreme weather conditions in critical periods of its life cycle and is able to recover if the climatic and weather conditions return to being suitable. This pattern shows on the larger data set of counted larval nests between 1998 and 2012.

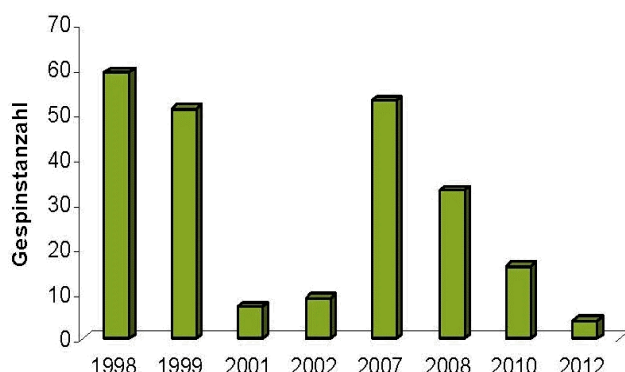


Figure 2. Larval nests between 1998 and 2012

Altogether 28 imagines and 6 larval nests (on *Fraxinus excelsior*) were recorded in a non-standardised survey in 2019 prior to the ex-post. According to expert Dr Patrick Gros responsible for butterfly surveys during the project, and who carried out the 2019 survey, the relatively high number of nests found can be considered remarkable, as egg clutches are usually difficult to find and they were not systematically searched for during the field days in 2019. In view of the relatively high number of observed individuals, it can be assumed that *Euphydryas maturna* was relatively well represented in the area of the Natura 2000 site Untersberg Vorland. A comparison with previous surveys (see above) allows the conclusion that the current situation of the population in this area can be described as stable.

Table 13. Population of 'Euphydryas aurinia', 'Phengaris teleius' and 'Lopinga achine'

Year	<i>Euphydryas aurinia</i>	<i>Phengaris teleius</i>	<i>Lopinga achine</i>
2007	118	34	9
2008	178	55	6
2010	314	12	0
2012	320	20	0
2019*	49	3	0 (12)

*2019 only a short non-standardised field survey was carried out

In 2019 49 imagines of *Euphydryas aurinia* were found in five areas with *Molinia* meadows. In view of the fact that no standardised survey was carried out ("random observations"), this high number can be assumed as an indication that *Euphydryas aurinia* was also well represented in the area in 2019.

Three imagines of *Phengaris teleius* were found in three different litter meadows. Few individuals were observed, but exactly where the species always had its main distribution focus in recent years. The low number of observed individuals can also be explained by the fact that cloud cover during the survey increased for a short time, which had a negative impact on the activity of this discrete butterfly species. In view of the fact that this species was also not specifically surveyed ("incidental

findings"), it is also very likely that the current situation of the population in this area will remain stable on the basis of previous surveys (by Dr P. Gros in 2008, 2010 and 2012). Potential caterpillar forage plants (*Sanguisorba officinalis*) and suitable habitat structures were still well represented.

Altogether 12 imagines of *Lopinga achine* were sighted in the light forest stands immediately east of the borders of the Natura 2000 site. According to the report, *Lopinga achine* has always been rare and sporadic in this area, as suitable habitat structures (very light forests on poor soil) are still sparsely represented. Nevertheless, the current population in this area can be assumed to be stable in comparison with previous surveys.

Table 14. Conservation status of 'Euphydryas maturna' (as reported in the Article 17 national summary

CS 2012	CS 2018	Reason for change of CS	CS trend 2012	CS trend 2018	Reason for change in CS trend	Trend 2018 in Natura 2000
U2	U2	no change	=	-	genuine change	x

The genuinely negative trend of conservation status of *Euphydryas maturna* (always U2, but increasingly deteriorating) is explained by the rapid spread of ash dieback disease, a serious disease of ash caused by the fungus *Hymenoscyphus fraxineus*. The fungus was described as a new fungal species in 2006 as the cause of ash (*Fraxinus excelsior*) mortality in European countries during the previous ten years. The disease affects trees of all ages.



7. Meadow management for butterflies in Germany: establishing the role of 'meadow managers'

In the wide-ranging project 'LIFE rund ums Heckengäu' (LIFE10 NAT/DE/000005) specific aims for grasslands and butterflies included development of semi-natural dry grasslands (6210*) and lowland hay meadows (6510) on 60 ha, improvement of dry grasslands along 10 km of hedges and lowland hay meadow management contracts for 5 ha, targeting dusky large blue *Maculinea nausithous* and scarce large blue *Maculinea teleius*, both listed in annexes II and IV of the Habitats Directive.

The project successfully completed its actions and helped establish Landschaftserhaltungsverbände (LEVs) in the counties for project continuity. A landscape conservation association (LEV) is an organization for landscape maintenance and landscape conservation organized as a registered association. Members are the counties, municipalities belonging to the district as well as associations and clubs concerned with nature conservation (e.g. Naturschutzbund Deutschland (NABU), hunting associations, farmers' associations, etc.). The umbrella organization is the German Association for Landscape Management (<https://www.lpv.de/themen/landcare-english-page/landcare-in-germany.html>).

The creation of a pool of sites with butterfly friendly meadow management has grown since the end of the project and will continue to grow in the future. The number of contracts with farmers is up from 14 contracts to 26 and the total area of lowland hay meadow under contract has increased from 24 ha to 39 ha since the project. Thus, an improvement of the habitats of the two butterfly species has taken place. The farmers contracted during the project are all still under contract and additional contract partners have joined. This shows that the work of the meadow managers from the LIFE project initiated the extensive management of the meadows seen today.

Project 'meadow managers' were able to persuade farmers to sign up contracts for the conservation of the butterfly species. Through these contracts a specific mowing regime was established, which allows the successful reproduction of *Maculinea* sp. on these meadows. Such intensive consultations with farmers can be replicated by other projects dealing with the conservation of these butterflies. Local landowners in Böblingen and Enzkreis, for example, have shown a growing interest in preserving species on their meadows.

The project shows that it is important to have a trustful relationship between farmers and the person leading negotiations, formerly the meadow managers and now the LEVs. Getting to know each other is very important for convincing the farmers to sign the contracts. Nature conservation managers must also allow some flexibility and a more relaxed approach to mowing times increases the acceptance of the contract by the farmers. For example, if after an extremely wet spring and early summer mowing before 10th June was impossible and vegetation growth was delayed then the deadline can be moved. In all this the availability of management plans is a key factor for successful implementation of nature conservation activities, such as negotiations with farmers.

Ongoing management of the dry grassland and lowland hay meadows is secured through involvement of the LEVs. Their main aim is to convince farmers to establish nature-conservation farming methods at district level. Hence, these institutions are well qualified to continue the project actions. The contracts with farmers are based on the internal regulations of the state of Baden-Württemberg which foresees contracts with a maximum duration of 5 years.

The long-term project impact cannot yet be assessed until there is up-to-date monitoring on *Maculinea* sp. and the local status of lowland hay meadows (6510).

The status of *Maculinea teleius* and *M. nausithous* and of habitat 6510 was recently assessed at state-wide level and assessed as negative. *Maculinea* sp. receive special attention through the species protection programme of the federal state of Baden-Württemberg and are mapped and monitored within the framework of the management plans. For the *Maculinea teleius* populations in the county of Ludwigsburg there is a current assessment on whether the maintenance of the lowland hay meadows was successful. The study will be available in 2020.

Table 15. Population status Federal State of Baden-Württemberg. Source: <https://www.lubw.baden-wuerttemberg.de/natur-und-landschaft/ffh-richtlinie1470126185389-0>

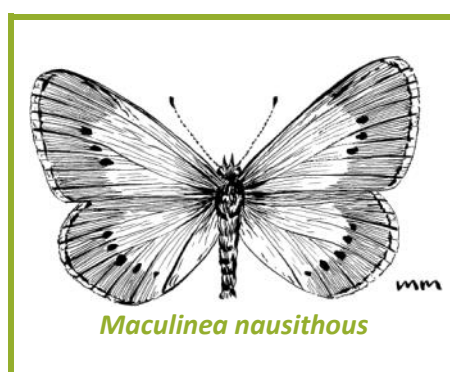
Species	Before the LIFE project (2007)	During project (2013)	After project (2019)	Population trend
<i>Maculinea nausithous</i> (dusky large blue)	FV	FV	U1	unchanging
<i>Maculinea teleius</i> (scarce large blue)	FV	FV	U1	unchanging

Table 16. Habitat Area (Habitat condition) Federal State of Baden-Württemberg. Source: <https://www.lubw.baden-wuerttemberg.de/natur-und-landschaft/ffh-richtlinie1470126185389-0>

Habitat	Before LIFE project (2007)	During project (2013)	After project (2019)	Trend overall
Semi-natural dry grasslands 6210, partly rich in orchids 6210*	U1 (FV)	U1 (U1)	U1 (U2)	U1
Lowland hay meadows 6510	U1 (?)	U1 (U2)	U1 (U2)	U2

Certain questions arose during the ex-post evaluation:

- Are the butterflies present on all sites that are currently under contract?
- How much area of loosely connected butterfly friendly managed lowland hay meadow ensures the survival of a local population?
- Which factors, other than the presence of the food plant and ant species, and the absence of fertilizers, are relevant for the presence of *Maculinea teleius* and *M. nausithous*?
- How will the change of climate affect the timing of the development of the butterflies? Will the time frame for the mowing have to be shifted?



8. Focus on restoration of priority grassland habitat in Italy

The main aim of the Italian project 'Restoration and conservation of dry grasslands in southern and central Italy' (LIFE09 NAT/IT/000118) was the long-term conservation of two priority habitats that depend on good agro-pastoral management practices: the *Festuco-Brometalia* grasslands - 6210* semi-natural dry grasslands and scrub land facies on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites) - and the pseudo-steppe of *Thero-Brachypodietea* - 6220* pseudo-steppe with grasses and annuals of the *Thero-Brachypodietea*. The focus on these priority habitats gave the project a 75% EU co-financing rate.

An additional objective was the conservation of one moth and one butterfly species associated with these habitats, the Annex II moth eastern eggar *Eriogaster catax* and Italian marbled white butterfly *Melanargia arge* (also an Italian endemic). The project focused on three Natura 2000 sites in the Apennines.

The project carried out a range of habitat conservation actions including scrub control, eradication of invasive species, establishing grazing (including purchase of livestock) and reseedling of pastures. In the short term, the project was effective, achieving the main expected results by improving the conservation status of the target habitats. The target invertebrate species showed fluctuations; these species are extremely sensitive to changes in the weather and the data show considerable variability, partly because of the few years covered by project surveys and partly for bad weather conditions in those years. However, new habitat suitable for future colonisation was created which should sustain populations in the long term.

The direct participation of farmers in the implementation of conservation actions was one of the most important elements of the project. The collaboration and participation of animal breeders allowed the achievement of the objective not only in formalising grazing plans but also in other related activities.

Unfortunately, due to financial shortages, the Park of Gallipoli Cognato is not planning to carry out ex-post monitoring activities in the near future. In April 2019, the former associated beneficiary Università di Tor Vergata applied for RDP funds for studying the biodiversity of the region's Natura 2000 sites. If this is approved (expected December 2019), the distribution and conservation status of *Melanargia arge* and *Euphydryas aurinia* will be studied at all the Natura 2000 sites of the region. *Eriogaster catax* was not selected due to the effort required (and consequent budget) for a full estimate of its presence in the region.

In April 2019 Regione Lazio adopted its Prioritised Action Framework (PAF), which means that the conservation measures targeted in the PAF for the different Natura 2000 sites could start to be financed by the region, starting probably from 2021. Grazing plans for the conservation of dry grasslands are included among the best practices for the conservation of habitats 6210* and 6220*.

The project has identified contrasting issues with sustainability. It worked in two regions, Lazio and Basilicata. It concludes that without a committed local management authority, the sustainability of grazing plans cannot be guaranteed. The project effort in education and training of stakeholders was the same in both areas: in Basilicata grazing plans are implemented whereas in Lazio they are not. So, in one case the presence of a park can guarantee proper maintenance and surveillance of the work done, whilst in the other, sceptical local authorities managing the state-owned pastures and farmers cannot or do not want to do the same. At the sites in Lazio breeders also have problems with wolves and goat grazing is being abandoned. As discussed at the ex-post mission with the functionary of Regione Lazio (the managing authority of Natura 2000), local authorities and farmers

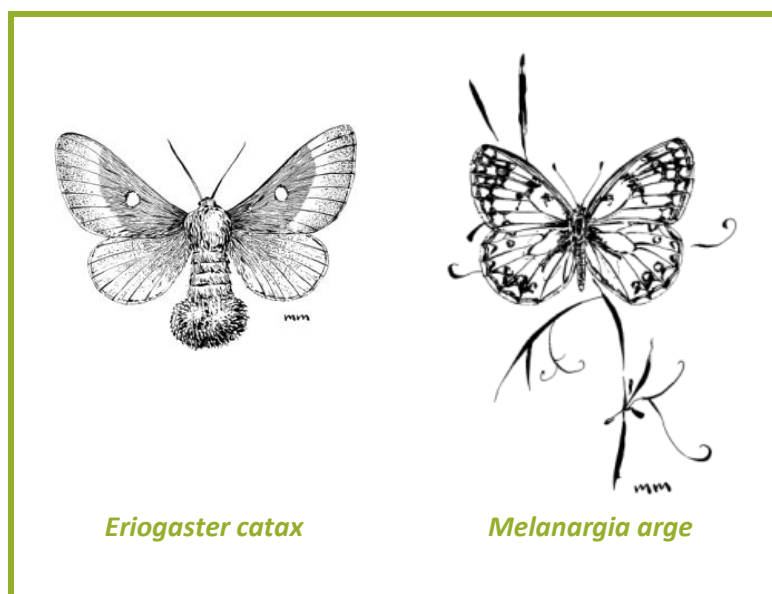
could apply for RDP funds to continue with the conservation work and have support against wolf predation, but they do not do it, perhaps because they are lacking a 'guide' to help them through the process. The former coordinating beneficiary Province of Rome, now Città Metropolitana di Roma, no longer has the competence, or personnel, after reorganisation following the National Law 'Del Rio' (56/2014).

During the project, ex-ante and ex-post surveys (after project interventions) were carried out on habitats 6210* and 6220* and target species. Surveys in Lazio were designed to understand the impact of the clearings made, while in Basilicata, where grazing plans could be conducted for a longer period of time, surveys were designed to understand the impact of grazing compared to un-grazed areas (fenced areas).

Melanargia arge populations, although with fluctuations, were found to be stable over the years and well established in their territories. Thanks to the restoration measures, they now have the potential to expand into wider suitable habitat. It has been shown that this species is affected by loss of habitat rather than any other threat.

Eriogaster catax was more difficult to monitor: the beneficiary was unable to capture adults of this moth with light traps as it appeared to be too rare to be sampled this way. According to experts, its rarity can also be explained by adverse weather conditions during the project years (strong wind, heavy rain, etc.). At the same time, monitoring larvae was a success: the silk tents built at the larval stage were easy to spot. After a nest was found, it was necessary to look closer at the caterpillars to distinguish between *Eriogaster catax* and the congeneric (same genus) *Eriogaster lanestris*.

Interestingly, another Habitats Directive species was found: *Euphydryas aurinia*. The abundance of both *Melanargia arge* and *Eriogaster catax*, coupled with the consistent presence of *Euphydryas aurinia* and the optimal conservation status of the habitat makes this area very valuable.



9. Land use changes threaten rare dragonflies

The main aim of the project 'Lomellina' in the Italian province of Pavia (LIFE03 NAT/IT/000109) was to halt the degradation of the alder woods forming heronries and to safeguard the presence of the heron colonies (i.e. night heron, little egret, squacco heron, purple heron and others). The main project actions were water management interventions, essential to maintain the vitality of the alluvial forests and of the species connected to these ecosystems, including dragonflies. This included monitoring and managing water levels, the management of water circulation inside the Natura 2000 sites and the restoration of springs, channels and locks.

The project was successful in protecting the alder forest habitat and the heron colonies. It and its continuation substantially mitigated some of the key pressures related to the conservation of the local nesting colonies of herons and local populations of dragonflies and butterflies. These successes were particularly important given the pressures that still affect nature in the Lomellina area, mainly linked to the dry cultivation of rice which has been introduced since around 2000.

The project improved the awareness of local administrators and farmers on the importance of conservation of priority birds and invertebrates species, and tested some new (for that time) methods for restoration works in reed thicket habitats. The measures carried out are included in the management plans of the eight target Natura 2000 sites. Capacity building was achieved through the cooperation of experts (silvicultural technicians and ornithologists/zoologists) and farmers (realising some of the interventions). This led to the more 'illuminated' farmers understanding the impact of their culture techniques on the conservation of flora/fauna species and to introduce some elements of sustainability in their practices (i.e. conservation of the vegetated borders of the hydraulic network, containment of IAS).

However, there have been difficulties after the project in reaching agreement on management at the scale of the Natura 2000 site. Difficulties were encountered in the dialogue with farmers, in particular regarding the management of the SPA *Risaie della Lomellina* which includes all the project sites. The management of this SPA is assigned to the province but a management plan has not been approved linked to political reasons. Considering the impact of dry rice production on nature conservation a management plan could have been used primarily to regulate rice crop management. But the interests linked to any such decision are huge as this is the major rice production district in Italy and the design/approval of this plan became a policy issue. A draft is ready, but it has never passed the consultation phase.

In the absence of a management plan, rice farmers cannot apply for the RDP funds specifically devoted to conservation measures in the Natura 2000 sites, and cannot therefore be funded to try to change cultural methods and come to a more sustainable (for nature) agriculture. As discussed with one of the farmers who collaborated in the project, most of the farmers are against returning to traditional ways as dry cultivation can guarantee budget savings in terms of water. Only he and some other neighbouring farmers are coming back to the traditional submerged way, but their lands represent less than the 8% of the total cultivated surface.

In 2014 the National Law 'Del Rio' (56/2014) reorganised the competences of the provinces in the final act of a process that had started in 2012. This law reduced the province's duties/responsibilities in terms of land management and nature conservation, and therefore compromised the sustainability of the Natura 2000 network. Before this law, the provinces were the main managing authorities of Natura 2000, together with the parks, in case the sites were included in their territorial limits. In the case of the Lombardy Region, after a period of adaptation and further changes, part of these competences were reabsorbed by the provinces, which could continue working on nature

conservation, but with a reduced budget and limited personnel. Due to this uncertain political framework, all the SCIs involved in the project completed the procedure to become SACs only in 2016, with official designation by Ministry Decree of 15 July 2016. As discussed during the ex-post visit, although there was commitment of its functionaries, the management of the Natura 2000 network was subjected to a hiatus in the years between 2012 and 2015. Thus the most substantial interventions to restore and maintain the works of this LIFE project were carried out after 2015.

Damselflies and dragonflies in particular were monitored in 2018, being a good indicator of the quality of habitats restored and the rice cultivation environment surrounding the Natura 2000 sites. As requested by the province, six out of eight project sites were surveyed. Table 17 below reports in blue the presence of species, according to monitoring done during the project in 2006 when only presence/absence was monitored. Quantitative monitoring during the 2018 survey is reported as follows: A: < 10 individuals; B: 10-50 individuals; C: 50-100 individuals; D: 100-500 individuals; E: > 500 individuals; the number of individuals spotted is reported for the Natura 2000 species. All species found in 2006 were confirmed and one more species was found, *Libellula depressa*. The presence of odonate species seems to be stable at all sites with slight differences in terms of number of species site by site compared to the 2006 situation. As also discussed with Professor Bogliani at the ex-post mission, these differences cannot be considered relevant due to the small number of surveys in 2018 (4 per site) and the fact that data cannot be quantitatively compared to information from 2006.

Table 17. Presence of Odonata species in 2006 (during the project) and 2018 (last monitoring campaign)

	IT2080001 Garzaia di Celpenchio	IT2080004 Palude Loja	IT2080005 Garzaia della Rinalda	IT2080007 Garzaia del Bosco Basso	IT2080009 Garzaia della Cascina Notizia	IT2080011 Abbazia Acqualunga
<i>Chalcolestes (Lestes) viridis</i>			A			
<i>Calopteryx splendens</i>	D	C	B	C	C	E
<i>Lestes sponsa</i>	A		A		A	A
<i>Sympecma fusca</i>						A
<i>Coenagrion puella</i>	A	A				A
<i>Ischnura elegans</i>	C		B	C	B	
<i>Platycnemis pennipes</i>	D	B	A	C	B	D
<i>Aeshna mixta</i>			A		A	
<i>Aeshna cyanea</i>	A					
<i>Aeshna isocetes</i>						
<i>Anax imperator</i>						A
<i>Anax parthenope</i>						A
<i>Boyeria irene</i>		A				
<i>Stylurus flavipes</i> *	2	3	5	6	5	3
<i>Gomphus vulgatissimus</i>	B	A	A	A	A	A
<i>Onychogomphus forcipatus</i>	A					A
<i>Ophiogomphus cecilia</i> *	1			1		
<i>Somatochlora metallica</i>	A		A	A	A	A
<i>Crocothemis erythraea</i>	D	A	D	A	A	B
<i>Libellula depressa</i>						
<i>Libellula fulva</i>	B	B	A	A	B	B
<i>Orthetrum albistylum</i>	E	C	D	C	B	B
<i>Orthetrum cancellatum</i>				A	A	
<i>Orthetrum coerulescens</i>	A	A				
<i>Sympetrum fonscolombii</i>	B	C	E	B	D	D
<i>Sympetrum pedemontanum</i>	C	B	E	C	D	D
<i>Sympetrum sanguineum</i>	A					
Total no. species 2006	17	14	18	14	15	14

*The presence of Community interest species *Stylurus flavipes* Annex IV and *Ophiogomphus cecilia* Annex II is confirmed at all sites where these species had been found in 2006.

As reported in Table 18, the presence of the large copper *Lycaena dispar* (Annex II) can be considered stable. As highlighted by Professor Bogliani, the conservation of this species is linked to the presence of *Rumex* species along the borders of the water channels (where its larvae forage). Its presence is therefore more affected by the management of the drainage network by individual farmers rather than specific restoration interventions.

Table 18. Presence of ‘*Lycaena dispar*’ in 2006 (during the project) and in 2018 (last monitoring campaign)

	IT2080001 Garzaia di Celpenchio	IT208000 Palude Loja	IT2080005 Garzaia della Rinalda	IT208000 Garzaia del Bosco Basso	IT2080009 Garzaia della Cascina Notizia	IT2080011 Abbazia Acqualunga
<i>Lycaena dispar</i> (2018)	15	1	3		2	2
<i>Lycaena dispar</i> (2006)	3	7		2	3	

The data regarding the conservation status of species of Community interest in the project sites confirm the general trend in the Article 17 report (period 2007-2012) and by the classifications of the IUCN Red Lists of the Italian species of Odonates (of 2014) and of Butterflies (of 2016) (see Table 19).

Table 19. Article 17 report (period 2007-2012) of the conservation status of ‘*Ophiogomphus cecilia*’, ‘*Stylurus flavipes*’ and ‘*Lycaena dispar*’ in Italy (Continental biogeographical region)

	IUCN Red List	IUCN Red List of Italian Odonates/Butterflies	Dir. Habitat	Current CS Habitats Directive Article 17	Previous CS Habitats Directive Article 17	Future prospective
<i>Stylurus flavipes</i>	LC	LC	Annex IV	FV	U2 (unfavourable/bad)	N/A
<i>Ophiogomphus cecilia</i>	LC	LC	Annex II	FV	U2 (unfavourable/bad)	N/A
<i>Sympetrum depressicolum</i>	VU	EN	N/A			
<i>Lycaena dispar</i>	LC		Annex II	FV	U2 (unfavourabl /inad)	N/A

The conservation status of the three species is considered favourable/least concern, with some doubts on the future prospective for *Ophiogomphus cecilia* (only two individuals found in the project area in 2018). As commented in the Article 17 report for the Continental region previous reporting round, the conservation status of this species was unfavourable. The change seems in this case to be non-genuine and influenced mainly by data from Bulgaria which did not report in 2007. This is why the future trend is to be considered with caution. Seven Member States of the Continental region report high importance threats and pressures related to modification of cultivation practices, agricultural intensification, fertilisation, diffuse pollution of surface waters due to agricultural and forestry activities, human induced changes in hydraulic conditions, canalisation & water deviation and modifications of hydrographic functioning, which could have an impact on the conservation of this species. These threats, and in particular the ‘modification of cultivation practices’, affect the project area.

10. Successful start of recovery of populations of marsh fritillary butterfly in Denmark

The 'LIFE ASPEA' project in Denmark (LIFE05 NAT/DK/000151) is a good example for demonstrating the importance of establishing broad cooperation with authorities and private landowners, facilitated by an increased knowledge of the species and its requirements and use of RDP funds for continued management post-LIFE.

The marsh fritillary butterfly *Euphydryas aurinia* has undergone rapid decline in Denmark due to the fragmentation of its habitats and populations. Together with a continuing decline in the quality of existing and potentially suitable habitats, the marsh fritillary is considered an endangered species. At the start of the project only eight small sub-populations remained, and it was crucial to reverse this negative trend if the butterfly was to continue to exist in Denmark.

The overall objective was to bring the threatened and isolated population of marsh fritillary in Denmark into a favourable conservation status. To reach this objective the project aimed to:

- Preserve and strengthen existing subpopulations through conservation measures. Each subpopulation should be stable or increasing and have a minimum size of 500 individuals or approximately 125 observed larval webs.
- Create opportunities for establishment of at least three new subpopulations from existing localities through restoration of potential habitats.
- Raise awareness of marsh fritillary amongst land users to ensure appropriate management of its habitats in the future.

The project achieved its overall objective of attaining favourable conservation status for the species through the strengthening of habitats. In the short term, the number of larval webs in the four-year period of the project doubled and four new subpopulations were added. It also improved the understanding of the species' ecology and dynamics, distributing this information to around 500 landowners and civil servants responsible for nature restoration. The project secured more than 500 ha of existing and potential marsh fritillary habitats in favourable condition within three Natura 2000 sites, boosting the survival prospects of the population in northern Jutland.

The project established cooperation on the management of the species including national and local authorities and private landowners that continues today. It established best practice for the management of the species and included this management in the Natura 2000 management plans implemented by the state and local level authorities. Similarly, the project contributed to the inclusion of appropriate management activities (scrub clearing, late grazing, low intensity grazing) in Danish RDP programmes.

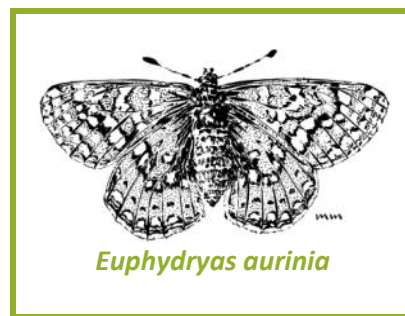
The 2019 Article 17 report for Denmark gives the conservation status for *Euphydryas aurinia* as unfavourable-bad but with a positive trend in the Atlantic region and unfavourable-inadequate in the Continental region but with a positive trend. Monitoring in 2019 identified new populations. Although the project did not reach the objective "to bring the population of marsh fritillary in Denmark into a favourable conservation status", it succeeded in improving the conservation status in the Continental region, which is now showing a positive trend. The objective for increasing the population size was reached. By the time of the ex-post mission the population had increased from 1,200 to 3,600 adult butterflies.

The population in the Atlantic region has been increased both in numbers of individuals and number of subpopulations, although the conservation status is still assessed as unfavourable-bad.

The project serves as a good demonstration of the effect of one-off restoration followed up by recurring activities such as grazing. The project activities have also been included in a Code of Best Practice.

Ongoing work includes:

- Management of habitats is continued through RDP funding for clearing, fencing and grazing.
- A network of state and local authorities, universities and private landowners supports the continued activities.
- Other LIFE projects were inspired and include relevant management activities for the species.
- Municipalities and the Nature Agency have included relevant measures in national and local Natura 2000 management plans. 70% of the present population is found on state-owned areas under NST Vendsyssel and management is financed through agreements with cattle owners.
- Landowners and local communities have become aware of the species and take an interest in it.
- Universities (e.g. Århus University) have focussed on the species, resulting in several publications e.g. on food biology.



11. Focus on long-term recovery plans for rare invertebrates in Cyprus

The LIFE project 'ICOSTACY' (LIFE09 NAT/CY/000247) focused on improvements to the conservation status of 20 species of bats, reptiles and invertebrates in Cyprus. Actions focused on collection of scientific data for the assessment of conservation status of the species, all with unknown or unfavourable conservation status. The two invertebrate species were the saproxylic beetle *Propomacrus cypriacus* and the Jersey tiger moth *Euplagia quadripunctaria*. About 10% of the project actions involved the two invertebrates and included identification and labelling of old oak trees, plantations of carob, oak and almond trees for *Propomarcus cypriacus* and creation of small ponds for *Euplagia quadripunctaria*.

Across the project the aim was to restore connectivity and mitigate the impacts of land use change and climate change by improving the ecological coherence of the Natura 2000 network for the targeted species, and to improve the conservation status of the species in terms of increased range, population size, preferred habitats and future prospects.

Both invertebrate species have very restricted but widely dispersed distribution and are difficult to observe. Thus no reliable population estimates were possible at the start and even at the end of the project. Instead, the fact that their known habitats are maintained in good condition is an indicator that the conservation status has or should have improved.

Follow-up by forest staff maintains plantations and protects old trees, the habitat for *Propomacrus cypriacus* and ponds have been maintained and new ones constructed to improve the habitat for *Euplagia quadripunctaria*. As very little was known about the two species a number of research studies and the work of the project itself has improved the knowledge base and provided a basis for conservation actions.

The project increased available habitat, increased knowledge, demonstrated with evidence cost-effective management measures, established monitoring methodologies and raised public awareness and sensitivity about the species. The project's findings contributed to the Article 17 report for Cyprus where, in the previous report, the assessment for most species was unknown.

The Cypriot Environment Department updated the Standard Data Forms for the two invertebrates in 64 Natura 2000 sites. *Eupalgia quadripunctaria* was removed from two sites, added to five sites, and confirmed in another 13 sites. *Propomacrus cypriacus* was added to two sites, and confirmed in another 10 sites. Both species are now included in the CY-Physis Integrated Project LIFE18 IPE CY 1000006 with the aim to produce Species Action Plans based on the knowledge gained from the ICOSTACY project.

The main problem continues to be limited knowledge about the two invertebrate species. They have been observed over a wide area in small populations, and systematic monitoring has not taken place except through the ICOSTACY project and subsequent preparation of the Article 17 reports. More monitoring is expected with the Integrated Project.

Propomarcus cypriacus is listed as Critically Endangered by IUCN and is included in the European Red List of Saproxylic Beetles. Its conservation status is based on its habitat needs, which depend entirely on veteran perennial trees where it breeds in decaying hardwood. As this habitat type is threatened with extensive fragmentation and continuing decline of hardwood trees, it is considered to be threatened.

Euplagia quadripunctaria is found elsewhere in Europe and is not globally threatened. However, in Cyprus, small and isolated populations exist in sparsely distributed sites, some of which are outside Natura 2000 sites.

Table 20. Information on the species collected at the ex-post mission

Species	Population in project area before project (t1)	Population in project area at end of project (t2)	Population in project area 5+ years after project (t3)
<i>Euplagia quadripunctaria</i>	Unknown	Unknown	141
<i>Propomarcus cypriacus</i>	Unknown	Unknown	64
Species	National population before project (t1)	National population at end of project (t2)	National population 5+ years after project (t3)
<i>Euplagia quadripunctaria</i>	Unknown	Unknown	293
<i>Propomarcus cypriacus</i>	Unknown	Unknown	168

Table 21. Information on the habitats monitored at the ex-post mission

Habitat	Area before project ha (t1)	Area at end of project ha (t2)	Area 5+ years after project ha (t3) (known range)
Habitat 1 <i>Euplagia quadripunctaria</i>	Unknown	239 sq.km	1,911 (sq.km)
Habitat 2 <i>Propomarcus cypriacus</i>	Unknown	168 sq. km.	2,410 (sq.km)
Habitat	Condition before project (t1)	Condition at end of project (t2)	Condition 5+ years after project (t3)
Habitat 1 <i>Euplagia quadripunctaria</i>	U1	Stable (0)	Stable (0)
Habitat 2 <i>Propomarcus cypriacus</i>	Unknown	Stable	Stable

The ICOSTACY actions covered an estimated 80% of the country's range of *Euplagia quadripunctaria* and 60-70% of the country's range of *Propomarcus cypriacus*.

For both species:

Range: Favourable (FV)

Population: Unknown (XX)

Future prospects: Favourable (FV)

Overall assessment of conservation status: Favourable (FV)

Current trend in conservation status: Stable (=)



12. Landscape-scale projects are expected to have a positive impact on invertebrates

It would be generally assumed that the larger the project, especially at a landscape scale, the better the outcomes for invertebrates. The 'Boreal Peatland' project in Finland (LIFE08 NAT/FIN/000596) aimed to enhance the habitat quality of 54 Natura 2000 sites in the Finnish peatland network covering 211,260 ha. There were actions within each Natura 2000 site, with a total area across all sites of 7,705 ha. The focus was on priority habitats aapa mires* (7310), bog woodlands* (91D0) and active raised bogs* (7110) which cover 77% (6,597 ha) of the project area.

Mires however are not species rich. The total area of mires in Finland is almost 9 million ha (28% of the land area). But the share of species which occur primarily in mire habitats is 4% of all well-known species in Finland, notably less than could be expected from the area of mires. The number of mire-specific species is low, but several forest species also occur on wooded mires.

In the end, the project restored 4,673 ha of peatland habitats in 51 Natura 2000 areas through detailed planning, land purchase and compensation payments, tree removal and restoration of hydrology. These largely one-off actions have allowed the target habitats to start to develop towards an improved conservation status. A substantial monitoring effort increased the understanding of the effects of restoration actions both on habitats and species.

Monitoring of Lepidoptera and Odonata was carried out: the result shows a positive trend for both on the restored sites.

For Lepidoptera the project reported the effects of drainage and restoration on total abundance and species richness of mire butterflies and other butterfly species, and on abundance of each individual species from a monitoring scheme developed by the LIFE project. Both abundance and species richness of mire butterfly species were lower in drained sites than in pristine sites, confirming that drainage has a negative influence on these species. An encouraging result was that the number of mire butterfly species already increased a few years after restoration work. The project therefore provided evidence that restoration is successful and increases the number of mire specialist species in restored mires. The monitoring established during the project is a good basis for future monitoring and every effort will be made to continue this monitoring to judge the long-term impacts of mire restoration.

For Odonata the project reported on how the abundance and species richness of Odonata (dragonflies and damselflies) respond to restoration by sampling larvae in three sites (restored, drained and pristine) in 12 study areas. Odonata larvae were sampled before restoration, during the first and the third year after restoration, and generalized linear mixed models (i.e. models with fixed effects and random effects) were used to analyse the effect of restoration. Before restoration drained sites had lower abundance and species richness than un-drained sites. During the third year after restoration both abundance and species richness had risen in restored sites. Adults of pre-selected indicator species were detected more often in restored sites than in drained sites. Results show that dragonfly species suffer from drainage but seem to benefit from peatland restoration and can colonize newly formed water pools relatively rapidly.

The targeted habitats do not require follow-up management. However, the monitoring actions do require long-term funding. The part follow-on project LIFE16 NAT/FI/583 Hydrology LIFE includes some of the monitoring sites in the previous project. However, the monitoring in Hydrology LIFE is on hydrological responses and interactions but not on monitoring Lepidoptera or Odonata which was included in Boreal Peatland LIFE.

The project concluded that in the coming decades the restored mires will increase in their natural value and become both structurally (habitats and species) and functionally (e.g. sequestration of carbon, flood control, nutrient uptake and circulation) closer to their natural state. In particular, the hydrological recovery is also important from the perspective of the Water Framework Directive as peatland restoration may also enhance the hydrological condition of downstream water courses in the long term.

The project published a handbook for the restoration of drained peatlands, [*Ecological restoration on drained peatlands – best practises from Finland*](https://julkaisut.metsa.fi/julkaisut/show/1733): <https://julkaisut.metsa.fi/julkaisut/show/1733>

13. Sustainability is necessary in European grassland management

The overall aim of the Polish 'Xeric Grasslands' project (LIFE08 NAT/PL/000513) was to improve habitat condition and reduce the spread of undesirable species on dry grassland habitats in eight Natura 2000 sites. Specific objectives covered: the reintroduction of traditional agriculture (mainly extensive grazing); developing a dynamic mosaic of habitats; and creating a knowledge base for the conservation of dry grasslands in Poland. The project also carried out conservation actions for associated species, including the extremely endangered plant species viper's bugloss *Echium russicum* (now *Pontechium maculatum*), the main target species, and *Stipa borysthenica* (a perennial bunchgrass species in the Poa family), both at risk of extinction.

The project addressed five Annex I habitats: 40A0 - subcontinental peri-Pannonic scrub; 5130 - *Juniperus communis* formations on heaths or calcareous grasslands; 6120 - xeric sand calcareous grasslands; 6210 - semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) and 91F0 - riparian mixed forests on *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia* along the great rivers (Ulmenion Minoris).

The project also paid attention to ensuring a good habitat for nine species listed in Annex II, including the invertebrate species *Colias myrmidone* the Danube clouded yellow, *Maculinea teleius* the scarce large blue, *Maculinea nausithous* the dusky large blue and *Lycaena dispar* the large copper.

The semi-natural dry grasslands in the project were small isolated patches (usually only a few ha) located in the most extreme habitats, steep slopes of river valleys and moraine hills, or limestone outcrops. Conservation methods were tested and refined: 'mobile pasturage', creation of surrogate habitats for dry grasslands in man-made areas (creating grasslands from scratch), and rehabilitation of highly transformed patches (including transplantation of patches of well-preserved grasslands, sowing seeds, stripping the top layer of the soil, etc.). At the same time, the project helped preserve and encourage local pasturing traditions and increased local awareness of the need to conserve these important grasslands.

The beneficiaries still maintain xerothermic vegetation complexes in a good state on 225 ha, thanks to continued extensive grazing (on 45 ha), mowing, elimination of invasive alien species and other unwelcome vegetation (removal of trees and bushes). From the field visit in 2019, the long-term positive impact on thermophilic grasslands is still visible. The project was the first in Poland to implement mobile pasturage, inspiring other organizations to use similar methods.

Thanks to continuous management, it has been possible to maintain the open and semi-natural character of the grasslands. The long-lasting impact is confirmed by monitoring habitats, mostly based on vegetation species. Whilst the target habitat state is slowly improving, the trend of the population of some species is difficult to see. This is likely to be a function of natural fluctuations and other conditions (such as droughts or floods) which may influence annual data. Monitoring of invertebrates is difficult, time consuming and requires specialised experts, and with only a few such experts in Poland, it is difficult to secure them for monitoring work.

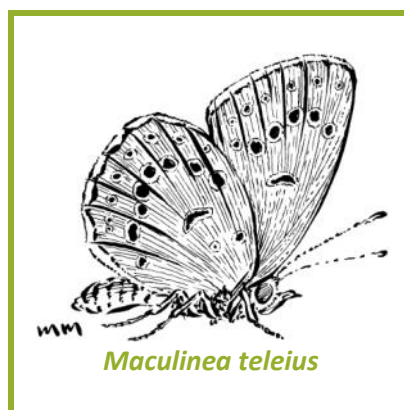
Overall the project targeted 225 ha (2.24%) out of c. 10,050 ha of the xerothermic vegetation complexes in Poland in the Continental region. Over 50% of the Polish xerothermic grasslands (5,783 ha) is protected within 151 Natura 2000 areas. As an additional output, the project updated the inventory of xerothermic grasslands in Poland.

Since information about the current status is not very accurate (no systematic monitoring of species) and the population status may differ from year to year due to changing weather conditions, the assessment of the population trend and conservation status of the target species in the project area is quite general.

The 2019 Article 17 report for Poland shows that for *Maculinea nausithous* (1061) and *Maculinea teleius* (1059) there is no change in conservation status of unfavourable-inadequate (U1), except improvement of knowledge for the first species. In the case of *Colias myrmidone* (4030) the status is still unfavourable-bad (U2). For *Lycaena dispar* (1060) the conservation status is favourable, however, no trends have been observed (unknown '+' or stable '='). Only for *Colias myrmidone* the status seems to be deteriorating '-'.

Table 22. Article 17 report of the conservation status of 'Maculinea nausithous', 'Maculinea teleius', 'Colias myrmidone' and 'Lycaena dispar' in Poland

Feature name + code	Region	MS	Presence	Conclusion of assessment	Reason for change - CS	Conclusion of assessment trend	Reason for change - trend in CS	Natura 2000 trend	Use for stats	
Maculinea nausithous (1061)	ALP	PL	PRE	U1	No change	+	No change	+	Yes	
	CON	PL	PRE	U1	No change	+	Improved knowledge	+	Yes	
Maculinea teleius (1059)	ALP	PL	PRE	U1	No change	+	No change	+	Yes	
	CON	PL	PRE	U1	No change	+	Different method	+	Yes	
Colias myrmidone (4030)	CON	PL	PRE	U2	No change	-	No change	-	Yes	
Lycaena dispar (1060)	ALP	PL	PRE	FV	No change	=	No change	+	Yes	
	CON	PL	PRE	FV	No change	=	No change	+	Yes	



14. Invertebrate species are highly dependent on habitat quality

The 'Eremita meadows' project in Latvia (LIFE09 NAT/LV/000240) targeted 10 Natura 2000 sites providing important habitat for the Annex II priority beetle species *Osmoderma eremita* and *Phryganophilus ruficollis*. In particular, it focused on the priority habitat 6530* Fennoscandian wooded meadows. The project objectives were: to develop a comprehensive ecological management system for wooded meadows and rare species dependent on old-growth trees and undisturbed forest habitats; to ensure the conservation of the two priority beetle species; and to support the further development and implementation of the Natura 2000 network by involving landowners and other stakeholders in the management of sites, to continue traditional extensive management of wooded meadows and other habitats.

A preparatory action was development of an ecological network plan for conservation of rare saproxylophagous (feeding on dead wood) beetles. Over 500 locations of *Osmoderma barnabita* were recorded, mapped and entered in the national GIS database.

According to genetic analysis, all collected samples (394) from several sites in Latvia belong to one species, *Osmoderma barnabita* <https://www.iucnredlist.org/species/157901/5169119>, and not *Osmoderma eremita* <https://www.iucnredlist.org/species/15632/105873655>, both listed as Near-Threatened. Thus, research results are also a significant contribution to the definition of distribution of the *Osmoderma* genus in Europe. The project largely increased the knowledge base about the targeted species.

Ten demonstration sites were developed to show possibilities for biodiversity-friendly management in wooded meadows, near old, big trees, which serve as habitats for many animal and plant species. Landowners were and are still motivated to carry out conservation work on their land as they can receive agri-environment subsidies. The project helped private landowners apply for funding under national and EU agri-environmental programmes after the project.

Although 60 ha managed (40 ha wooded meadows and 202 trees in 20 ha) represents a very small part of the total area of priority wooded meadow habitat in Latvia, it still plays an important role in reducing fragmentation. This is especially important in the nature reserves Lubāna Wetland and Sita and Pededze Floodplain, home to one of the largest wooded meadow areas in Latvia. As a result of management measures, improved light conditions for biologically valuable large-dimension trees provided favourable conditions for the project's target species, deciduous bark beetles and other species related to old wooded meadows.

The restored wooded meadows are used for hay making and grazing with potential to replicate this work on other sites. The project demonstrated how to manage protected areas in an economically attractive way. The most tangible impact is on landowners who are maintaining the wooded meadows and continuing the management of the valuable grasslands, which according to the landowners and project management would not have been done to the current extent without the LIFE project.

The tables below (Tables 23 and 24) show the comparison of Article 17 reports for the period 2007-2012 and 2013-2018, indicating improved status for both *Osmoderma* and wooded meadows. The ex-post mission, only 3.5 years after the project, was too early to evaluate changes in the quality of habitats and species. Experts from the University of Daugavpils advise that an increase in shading is one of the most important factors affecting the quality of the habitat in the Boreal region. One of the aims of the habitat management programme for Fennoscandian wooded meadows was to improve the lighting conditions and thus the quality of the habitat for *Osmoderma eremita*. Since

2016 the University of Daugavpils is involved as associated beneficiary in the project LIFE16 NAT/LT/000701 'Ecological network for *Osmoderma eremita* and other species dependent on veteran trees'.

Table 23. Article 17 information

Reporting period	Group	Species	Range	Population	Habitat for species	Future prospect	Overall trend in CS	Trend
2007-2012	invertebrates	<i>Osmoderma eremita</i>	U1x	U2X	U2X	U2X	U2X	
2013-2018	invertebrates	<i>Osmoderma eremita</i>	FV	U2	U2	U2	U2	X

Table 24. Article 17 information (2)

Period	Habitat code	Habitat	Range	Area	Specific structures and functions	Future prospect	Overall CS	Overall trends	Area in Latvia (km ²)
2007-2012	6530*	Fennoscandian wooded meadows	XX	U2-	U2-	U2-			11.6
2013-2018	6530*	Fennoscandian wooded meadows	FV	U1	U2	U2	U2	X	10.75-14.0



15. The value of a meta-project with a long-term vision

The Belgian project 'Rehabilitation of peat and wet habitats on the Saint-Hubert Plateau' (LIFE03 NAT/B/000019) was the first of a series of six LIFE projects across the Ardenne Plateaux which has formed a continuous 17-year meta-project from 2003-2020.³¹

For the Saint-Hubert project an 842-ha work area was identified, covering the zones where peaty areas or very wet soils overlapped with c. 300 ha of degraded spruce plantations. Actions included land purchase, cutting and removing trees and restoring a more natural water regime by drain blocking and small dams. Tree and purple moor-grass *Molinia caerulea* colonisation was controlled by cutting young trees and by sheep grazing designed to be financially self-sustaining. This first project was the model for similar restoration efforts on the other high plateaux of the Ardenne region where non-sustainable forestry has caused conservation problems.

The focus was on direct improvement of the habitats on the Saint-Hubert Plateau and restoration of connectivity, with seven target habitats and three others benefitting from the work. Habitat 3160 natural dystrophic lakes and ponds was not a target habitat but benefitted from rewetting and is the main habitat for the restoration of populations of endangered dragonflies.

Private landowners, public landowners and hunters supported the project and at the time of the ex-post visit they still support its results, with nobody putting them into question. The forest administration continues to cut spruce plantations when they reach commercial felling age and in strategic locations these are not replaced by new conifer plantations. So the area of conifers continues to reduce to the benefit of open habitats or deciduous forests and the connectivity between these habitats.

As a result, the habitats on the restored areas evolve slowly towards target habitats. Indeed, studies have shown that the evolution towards target habitats is slower on the St-Hubert Plateau than on the other plateaux. The explanation is that the baseline at the start of the project was less favourable for restoration: the sites were more degraded, isolation/lack of connectivity was higher, areas of surviving open landscape were much smaller, there was an absence of well-conserved examples of given habitats, deeper depletion of the seed banks and general absence of protected areas.

Results for invertebrates have been recorded. The butterfly cranberry fritillary *Boloria aquilonaris* had disappeared from the Saint-Hubert Plateau some years before the project. Restoration and management works in one location resulted in a spectacular increase of the cranberry plant *Vaccinium oxycoccos* on which the caterpillars feed. As a result, *Boloria aquilonaris* has re-colonised the plateau.

The development of numerous spots of habitat 3160 natural dystrophic lakes and ponds, due to hydrological restoration works, resulted in a substantial increase of the populations of Odonates (e.g. keeled skimmer *Orthetrum coerulescens* and northern emerald *Somatochlora arctica*).

The project developed a robust monitoring methodology to test restoration measures at appropriate scales in the field. After the project the Walloon Region developed an expert structure for monitoring the results of the LIFE meta-project and other LIFE projects. Three main axes were developed in this monitoring: birds, vegetation and invertebrates (butterflies and dragonflies).

³¹ The linked projects are LIFE05 NAT/B/000087 Cx SCAILLE (Croix Scaille), LIFE05 NAT/B/000089 PLT TAILLES (Tailles Plateau), LIFE06 NAT/B/000091 PLT Hautes-Fagnes (Hautes-Fagnes Plateau), LIFE08 NAT/B/000033 LOMME (Bassin de la Lomme) and LIFE10 NAT/BE/000706 Ardenne liégeoise.

For the impact of the project on invertebrates it is best to look at the whole 'Plateaux Ardennais' meta-project. Dragonflies and butterflies were selected for monitoring because:

- There are not too many species in these groups;
- With minimal training and practice most are relatively easy to identify even using binoculars;
- These groups are popular and it is easy to find volunteers for surveys;
- The distribution and ecological requirements of these groups are well known;
- These groups are known to be able to react quickly to the modification of the habitats.

Data are more readily available for dragonflies than for butterflies. Whilst monitoring of butterflies is carried out with the same care and intensity as monitoring of dragonflies, the processing of data is less advanced. Furthermore, butterflies are reacting slower than dragonflies as they seem to be more sensitive to the evolution of the habitat/structure and availability of the associated plant species on which they depend. It seems that more time is needed, after restoration work, to get a suitable habitat for butterflies than for dragonflies. Dragonflies are also generally more mobile than butterflies and therefore more able to find and use new opportunities.

The six LIFE projects already or almost completed by September 2019 give the following outputs:

- Restoration measures on 6,300 ha;
- Establishment of legal protection status (mostly State Nature Reserve) for 3,440 ha of restored areas (including purchase of 630 ha, 452 ha state-owned and 178 ha Agreed Nature Reserves from NGOs, and long-term agreements for other properties, mainly municipal land);
- Removal of 2,570 ha (1,911 ha on peat soils) of conifer plantations (mainly spruce) and abandonment of conifer cultivation on these areas;
- Neutralisation of 674 km of drains;
- Creation of 775 ponds and 11,895 small ponds;
- Construction of 40 km of dykes for rewetting of 47 ha (paludification);
- Top soil removal on 179 ha of degraded heath;
- Grinding/chipping of 192 ha of degraded bogs;
- Recreation of 337 ha of diversified deciduous forest;
- Establishment of restoration mowing and mowing management on 227 ha of open habitats;
- Grazing management on 735 ha of grasslands and heath (sheep and cattle, locally horses).

The total budget of the meta-project was €22 million: 50% provided by the LIFE programme. The breakdown by key actions is 30% for land purchase, 41% for restoration actions and 29% for management of the projects, monitoring, networking and dissemination.

The short- to medium-term impact of the meta-project is greatest for dragonfly species as they are mobile and reactive and able to rapidly colonise new ponds or inundated ditches. A ubiquitous species like common blue damselfly *Enallagma cyathigerum* is more abundant on larger water bodies, whilst subarctic hawkmer *Aeshna subarctica* and white-faced darter *Leucorrhinia dubie* appear only on older ponds colonised by *Sphagnum* mats. Dragonflies typical of peat bogs are more abundant on ponds colonised by a thick mat of *Sphagnum* partially emerging from the water. And the frequency of endangered species is higher on very old ponds.

Some species spread less quickly than others. But the ponds themselves evolve very quickly and the colonisation by floating mats of *Sphagnum* is often clearly visible after five years. Monitoring also showed that different works have different impacts on the list of species: water bodies formed by

rewetting dykes and top soil removal areas host more abundant and species-rich populations but restored or older ponds host more species typical of peat bogs and/or endangered species.

The general conclusions of the after-LIFE monitoring of the meta-project are:

1. An increase of species population size and species diversity, both at the level of the six plateaux and the level of the restored sub-sites, is explained by the increase of area of water bodies and the diversity of types of water bodies. Abundance sometimes increases spectacularly. On the Plateau des Tailles the population of northern damselfly *Coenagrion hastulatum*, a rare and endangered species in Wallonia, was very small (a few tens of individuals) before the LIFE project and jumped to several thousands of individuals after the hydrological restoration works. The increase in species diversity is illustrated by the results on St-Hubert Plateau. Between 2004 (before the works) and 2009 the total number of dragonfly species on the St-Hubert Plateau increased from 20 to 37. When considering only the sub-sites on which works were implemented, the number increased from 17 to 34. On the Plateau des Tailles the number of species increased from 15 in 2006 to 28 in 2010.
2. An increase of the range (in Wallonia) of species specialists of peat bogs (northern damselfly *Coenagrion hastulatum*, white-faced darter *Leucorrhinia dubia* and ruby white-face *Leucorrhinia rubicunda*).
3. The colonisation of some plateaux by species previously absent: *Leucorrhinia rubicunda* (Croix-Scaille, St-Hubert), *Orthetrum coerulescens* (Croix-Scaille, St-Hubert) and *Somatochlora arctica* (St-Hubert). These colonisations were unexpected and on St-Hubert this is probably a colonisation from the increased population on Plateau des Tailles. Further colonisation towards Croix-Scaille is probably sourced from St-Hubert illustrating the enhanced network effect of the whole meta-project.

The LIFE meta-project resulted in the improvement of the conservation status of several dragonfly species on the Ardenne Plateaux.

Table 25. Evolution of the conservation status (at the Walloon level) of 7 dragonfly species during the period 2000 – 2017, corresponding to the implementation period of the LIFE projects in the context of the LIFE meta-project. RE: Regionally Extinct, CR: Critically Endangered, EN: Endangered, VU: Vulnerable, LC: Least Concern.

Taxon	LR 2000	LR 2017 validé
<i>Aeshna subartica</i>	CR	EN
<i>Coenagrion hastulatum</i>	CR	EN
<i>Ischnura pumilio</i>	VU	LC
<i>Leucorrhinia pectoralis</i>	RE	VU
<i>Leucorrhinia rubicunda</i>	CR	EN
<i>Orthetrum coerulescens</i>	EN	LC
<i>Somatochlora arctica</i>	EN	VU

The dragonfly yellow-spotted whiteface *Leucorrhinia pectoralis* is a particular case. In 2012, in the Red List of dragonflies for Wallonia, this species was classified as Critically Endangered and even Extinct in the most recent evaluation (2006). Sporadic occurrences appeared nevertheless between 2006 and 2012. The species is considered endangered at European level and is included in Annexes II and IV of the Habitats Directive and is a priority species in Wallonia.

During the week 24-30 May 2012 a sharp peak of observations of the species started suddenly in Wallonia (and in Flanders and northern France). This corresponded with a period of dry and warm weather with strong eastern air currents. The sudden number of observations has been attributed to

an invasion of individuals from eastern countries where the species is well represented. The question was then if the species was able to establish permanent and stable populations.

It seems that this is the case as the status in the Red List for Wallonia was upgraded from Regionally Extinct in 2000 to Vulnerable in 2017 and populations were established and continued to reproduce on all Ardenne Plateaux. The improvement of the habitat in the context of the meta-project may partially be considered a driver of this establishment. Indeed, the species is linked to ponds and lakes with oligotrophic water and the area and number of locations of habitat 3160 natural dystrophic lakes and ponds increased spectacularly due to the hydrological restoration works in the LIFE meta-project, increasing the opportunities for this species. Furthermore, the species was also observed in restored ponds in the context of other LIFE projects. If the settlement of these new populations is confirmed in the future, perhaps the meta-project may be considered to have increased the range of this species in Europe.

16. Habitat management supports biodiversity

The 'Liereman' project in Flanders (LIFE04 NAT/BE/000010) set out to restore the natural values of the De Liereman complex of habitats, from dry heathland on the hills to oligotrophic ponds in the bottom of the valleys, through a large-scale coordinated programme of action. The project sought to deliver a comprehensive management plan to reduce habitat fragmentation and start restoration works. Large conifer plantations would be cleared and a number of cottages removed from strategic locations to enable the natural redevelopment of heath. Locally, cleared areas would be sod-cut to restore the humid-depression fen vegetations of wet heath and, on the slopes, the rare *Nardetalia* vegetation. Filled and drained oligotrophic ponds would be restored. To support and enable these actions, the project foresaw the purchase of 132 ha of land. The aim was that this initial investment should start the long-term sustainable management of the site, including controlling visitor access to the more fragile areas.

This was a traditional habitat restoration project targeting 11 Annex I habitats, some Annex II species and Annex I Birds Directive birds. Actions included land purchase, hydrological studies, and preparation of an integrated management plan addressing nature and recreation. The studies identified the main action to be the relocation of the major watercourse carrying eutrophic water from farmland.

All 11 targeted habitats are in better condition than before the project. The holistic view of the project brought additional benefits: ecosystem services, climate change mitigation, climate change adaptation, recreation, education, tourism and still some agriculture but with the capacity for habitats supporting invertebrate species.

Actual follow-up in terms of concrete actions for nature has taken a long time and has not yet started. Key actions remaining are the relocation of the nutrient-rich waterway, the installation of natural retention areas and land swaps for remaining agricultural plots in the core area.

Table 26 gives the status of target habitats in 2004, 2010 and 2018. The method of measuring the surface area differs in 2018: previously the habitat mosaic was measured whereas in 2018 each habitat is measured separately. However, it is clear that each habitat has evolved positively.

Table 26. Habitat evolution

Habitat	Habitat code	Surface area 2004 (ha)	Surface area 2010 (ha)	Surface area 2018 (ha) within SBZ
Mosaic heath dunes and dry heath	H2310, 4030	7.88	9.29	H2310: 4.31 H4030: 57.74
Mosaic dune grasslands and dry heath	H2330, 4030	0.04	34.92	H2330: 4.24 H4030: 57.74
Oligotrophic to mesotrophic ponds	H3130	0.34	1.41	3.58
Mosaic wet heath and peat bogs	H4010, 7150	13.83	26.92	H4010: 46.65 H7150: N/A
Dry heath	H4030	6.80	7.37	58.73
Nutrient-poor grassland	H6230+	0.91	17.24	8.17
Old acidophilous oak woods	H9190	28.86	48.32	17.53
Bog woodland, <i>Alnion glutinosa-incanae</i>	H91D0, 91E0+	31.03	31.88	51.45

Table 27. Species evolution Flanders

Species	Status	Trend	Surface area sufficient?	Range	Pop.	Hab.	Prospect	Total	Trend
<i>Leucorrhinia pectoralis</i>	present	increasing	no	FV	U2	U1	U1	U2	+

Regarding invertebrates the project area is of high value. The inland sand dunes (2310 and 2330) are of significant importance for bees, wasps, beetles, grasshoppers, crickets, dragonflies, moths, butterflies and spiders. Almost all bee species benefitting from dry and wet heath have been identified since the restoration was completed as well as silver-studded blue *Plebejus argus*. This butterfly is an indicator of active lowland heath management.

Table 28. Invertebrates

Species	Amount (species)	Examples
Butterflies	36	<i>Carterocephalus palaemon</i> , <i>Limenitis camilla</i> , <i>Callophrys rubi</i> , <i>Plebejus argus</i> , <i>Saturnia pavonia</i> , <i>Anarta Myrtili</i> , ...
Moths	693	<i>Orgyia antiquoides</i> , <i>Phragmataecia castaneae</i> , ...
Dragonflies	43	<i>Leucorrhinia rubicunda</i> , <i>Leucorrhinia dubia</i> , <i>Leucorrhinia pectoralis</i> , <i>Ceriagrion tenellum</i> , <i>Ischnura pumilio</i> , ...
Grasshoppers and crickets	25	<i>Oedipoda caerulea</i> , <i>Chorthippus mollis</i> , <i>Omocestus rufipes</i> , <i>Stethophyma grossum</i> , <i>Gryllus campestris</i> , ...
Bees, wasps and ants	278	<i>Andrena fuscipes</i> , <i>Colletes succinctus</i> , <i>Colletes cunicularius</i> , <i>Ceratina cyanea</i> , <i>Philanthus triangulum</i> , <i>Mellinus arvensis</i> , <i>Conops vesicularis</i> , ...
Beetles	334	<i>Agonum viridicupreum</i>
Spiders	208	<i>Phaeocedus braccatus</i> , <i>Alopecosa fabrilis</i> , <i>Cyclosa oculata</i> , <i>Arctosa figurata</i> , <i>Ero aphana</i> , ...

17. Invasive species projects must be continued to completion

The project 'RARITY' (LIFE10 NAT/IT/000239) had two objectives: to combat the spread of the highly invasive alien species *Procambarus clarkii*, which was threatening native crayfish species' biodiversity with possible consequences on human health, and to improve the populations of the native crayfish species, *Austropotamobius pallipes*. To meet these objectives, the project drew up and implemented a regional regulation regarding crayfish fishing in the Friuli-Venezia Giulia (FVG) region, promoting the conservation of *A. pallipes*, and combating the spread of *P. clarkii*.

The project achieved the objectives through the control of the spread of the IAS *P. clarkii* (21,500 animals removed) and the enhancement of the population of the indigenous *A. pallipes* (34,806 animals released) in seven target sites.

Regional Regulation (n. 27 of 31/12/12) for the protection of *Austropotamobius pallipes* was issued thanks to the project. The body responsible for the promotion and implementation of activities aimed at preventing and controlling invasive crayfish is the coordinating beneficiary. Capture and release of invasive crayfish was prohibited (penalties from €25 to €500 foreseen): the regulation foresaw the application of the action plan elaborated in the project aimed at controlling the invasive species (approved by the Friuli-Venezia Giulia region but not yet by the Ministry of Environment).

The project impact is low in terms of survival rate of the target species populations and in terms of containment of the spreading of the IAS, especially because these actions did not continue after the project and there are deficiencies in the data available at the time of the ex-post visit. However, in terms of policy impacts, increased awareness among the public and improvement in the scientific knowledge on the target species and techniques to contrast alien crayfish, the project is still having a positive impact and these activities are ongoing.

The project was pioneering in introducing the problem of how to manage and how to increase awareness on IAS. Three innovative techniques were tested to help reduce the population of *P. clarkii*, as well as using a new non-invasive technique to detect the presence of the pathogen *A. astacii* in the species *A. pallipes*. A monitoring protocol for crayfish and a protocol for early detection rapid response were created by the project.

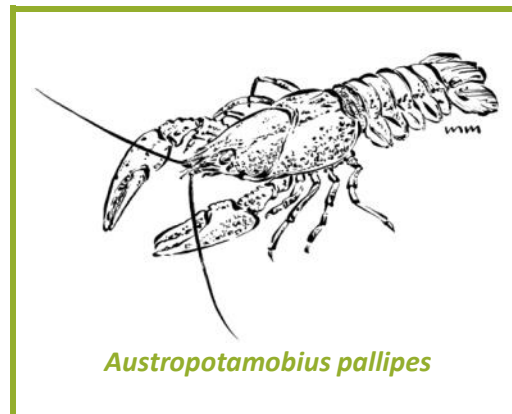
However, the incentive value of the project is low as it has not been able to attract additional financing. Monitoring of native crayfish and containing IAS populations requires continuous efforts that need a structured financing plan. Attempts to obtain other financing through the LIFE programme, Horizon 2020 programme and INTERREG failed. Currently, concept notes for two LIFE projects are under evaluation: LIFE19 NAT/IT/000843 LIFE EQUATE and LIFE19 NAT/SI/000748 LIFE for PALLIPES.

The target species were monitored in 237 stations in the Friuli-Venezia Giulia region. As an indicator for estimating the relative abundance of populations of native species and invasive species in Friuli-Venezia Giulia, catch per unit effort (CPUE) was used based on number of specimens captured with respect to number of trap-days. No data on the distribution and relative abundance of *P. clarkii* in the after-LIFE phase was provided since no monitoring was performed. Data on *A. pallipes* have been collected in the after-LIFE phase in the eight sites in which the animals were restocked and only one population was found in the SCI *Bosco Marzini* IT3310011.

The most interesting result regards monitoring the distribution of populations of *Austropotamobius torrentium*. The presence of this species was surveyed during the project by classic methods but it was never found in the target sites (only two individuals were found at the end of the project). In the

after-LIFE phase 15 stations were targeted for qualitative monitoring and data obtained confirmed the presence of 3 populations already detected 15 years earlier. Through use of an environmental DNA methodology it was possible to map the presence and distribution of this species in the FVG region: two stations in which *A. torrentium* was detected in the past did not show it anymore and three new stations showed a 50% probability of its presence, to be further surveyed. This survey, financed by the FVG region, has led to the creation of a new Site of Community Interest IT3320040 *Rii del Gambero di torrente* to protect stone crayfish *Austropotamobius torrentium* (IUCN data deficient <https://www.iucnredlist.org/species/2431/121724677>) which survives with only four populations in the province of Udine. The FVG region also enlarged the SCI IT3320006 *Conca di Fusine* and has consistently updated the Natura 2000 Standard Data Form.

The project received a small grant from the FVG region (€10,000) after its conclusion to map the population of the native stone crayfish *Austropotamobius torrentium*.



18. Improving habitats for butterfly species does not always lead to expected results in terms of recovering populations

The main goal of the 'Polish Wetlands Butterflies' project (LIFE06 NAT/PL/000100) was to secure the best possible conservation status and to upgrade the quality of habitats of six target butterfly species: *Lycaena helle*, *Lycaena dispar*, *Maculinea teleius*, *Maculinea nausithous*, *Euphydryas aurinia* and *Coenonympha oedippus* within four Natura 2000 sites.

The specific objectives were:

- Reversing forest succession of wet meadows and returning them to extensive agricultural use;
- Raising water level on drained wet meadows, which are losing butterfly host plant species;
- Elaborating and implementing management for the target species;
- Developing integrated management systems;
- Implementation of conservation and EU-supported programmes in the Natura 2000 sites;
- Raising public awareness in the Natura 2000 sites.

Suitable habitat was created for the species to spread and establish stronger populations and the project had a significant short-term impact on the conservation of the six target butterfly species. The project linked local nature management to regional socio-economic development by establishing a market for biomass. It supported local farmers by encouraging them to join the agri-environmental programmes and assisting them in planning management actions for butterflies. In addition, in every project Natura 2000 site, either local inhabitants or landowners were employed which helped with the perception of nature conservation. Long-term funding necessary to maintain the project results is based on agri-environmental funding and the budgets of the project partners (mainly the state institutions), but funding is becoming harder to secure in Poland, especially in state institutions responsible for nature protection.

Based on ex-post findings nine years after the project, it was found that in spite of the continuation of management according to project guidelines, the butterfly populations had not improved. The condition of target species rose as a result of the project, but c. 5 years after, the condition of populations deteriorated again, partly due to general climate change (desiccation) and partly due to generally difficult field and nature conditions (e.g. vigorous re-growth of scrub). It is difficult to see a distinct trend in these results because of the influence of weather on butterfly populations.

Long-term resources for monitoring are not fully secured and most programmes and funds do not finance these activities. This problem is mentioned in the Warsaw Wetland Declaration³² elaborated within the frame of the international conference organised by the project. Nevertheless, monitoring activities are continued by partners (Kampinoski National Park is carrying on butterfly monitoring on project areas in its territory using its own employees) or by the state institution GIOŚ under the State Environmental Monitoring, PMS.

The results of the initial analysis of the data indicate that the loss of habitats and host species are only examples of the many factors that negatively influence the target butterfly populations. It also appears that, for example, climate change could be a factor in provoking a significant decrease in the butterfly populations. Therefore, although the habitat conditions improved, the conservation status of the target species remains U2 (unfavourable-bad)/U1 (unfavourable-inadequate) and the butterflies are still threatened:

³² http://bagna.pl/images/WWD/Warsaw_Wetlands_Declaration.pdf

- *Lycaena helle*: remains U1 (unfavourable-inadequate) and for all of Poland it was evaluated as U1 (unfavourable-inadequate) in the Article 17 report 2019.
- *Lycaena dispar*: there is no information from the project sites, and for all of Poland it was evaluated as FV (favourable) in the Article 17 report 2019.
- *Maculinea teleius* and *Maculinea nausithous*: remains U2 (unfavourable-bad)/U1 (unfavourable-inadequate), while for all of Poland they were evaluated as U1 (unfavourable-inadequate) in the Article 17 report 2019.
- *Coenonympha oedippus*: remains U2 (unfavourable-bad), while for all of Poland it was evaluated as U1 (unfavourable-inadequate) in the Article 17 report 2019.
- Only *Euphydryas aurinia* increased from U1 (unfavourable-inadequate) to FV (favourable), while for all of Poland it was evaluated as U1 (unfavourable-inadequate) in the Article 17 report 2019.

It is difficult to determine which factors are driving this decrease even on well-maintained plots. For example, all plots within the Kampinoski National Park, in Puszcza Kampinowska Natura 2000 site, are regularly mown and target habitats well maintained (Table 30 below). The population of *Maculinea teleius* increased well in the 5 years after the project but since 2015 is decreasing again even though the habitat plots are mown each year (Tables 29 and 30 below).

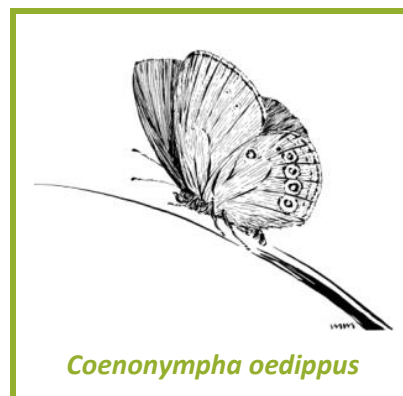
Table 29. Example of monitoring results in Puszcza Kampinowska Natura 2000 site

<i>Maculinea teleius</i>	2012	2013	2014	2015	2016	2017	2018	2019
Name of plot	no of individuals/100 meters of transect							
Opaleń	5	12.67	13.67	3.67	no info	2	no info	0.67
Truskaw	37.33	56.33	60.67	22		10.67		3.67
Wiejca	14	41.67	45	8		6		2.67

Table 30. Example of mowing in Puszcza Kampinowska Natura 2000 site

Name of plot	2012	2013	2014	2015	2016	2017	2018	2019
Opaleń	8.88 ha	8.3 ha	9 ha	9 ha	9 ha	9 ha	9 ha	9 ha
Truskaw	19.15 ha	15.8 ha	18 ha	18 ha	18 ha	18 ha	18 ha	18 ha
Wiejca	7.9 ha		11 ha	8 ha	8 ha	8 ha	8 ha	8 ha

It appears that stemming the decline in butterfly habitats and related host species was not enough to improve the conservation status of the target butterfly species. This is because there are complex factors which negatively influence the target species' populations. Some of these can be related to climate change; especially the increasingly dry summers and autumns with unusual periods of very cold and wet weather. The occurrence of these weather anomalies seems to have intensified since 2015 and at the same time it was observed that the species' populations started to decrease even on well-maintained plots. Therefore, a view from the ex-post mission is that monitoring of butterfly species may not be the best indication of habitat quality. Moreover, the results show that even though the conservation status of habitats was significantly improved, the target butterfly populations decrease rather than increase. It is therefore crucial to continue efforts to find how to better protect the endangered butterfly species.



19. Achieving favourable conservation status for habitats expected to benefit associated invertebrates

The main objective of the 'Pustynia Błędowska' project in Poland (LIFE09 NAT/PL/000259) was to secure favourable conservation status of the largest Polish complex of xeric sand calcareous grasslands (*6120) and inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330). Habitat restoration focused on the Pustynia Błędowska Natura 2000 site. The objective was achieved by testing, implementing and disseminating conservation measures, including clearing up part of the site that had previously been used as a military training ground. Key concrete conservation actions included the removal of trees and scrub (mainly Scots pine *Pinus sylvestris*, common birch *Betula verrucosa*, sharp-leaf willow *Salix acutifolia*, and creeping willow *Salix arenaria*) that had overgrown much of the site.

Trees and bushes were mechanically cleared from 335 ha. The removed wood was processed into biomass and given to public institutions. A detailed inventory of the site's flora and fauna and their locations, as well as the habitat types, was carried out during the clearing work to determine the best ways of protecting them.

The conservation status of both target habitat types at Pustynia Błędowska SAC, as well as the whole of southern Poland, was identified as unfavourable-bad (U2) in the first proposal of the Natura 2000 network in Poland (and at the start of the project). At the end of the project 31% of the area of targeted habitats was judged as favourable (FV), 46% as unfavourable-inadequate (U1) and only 23% as unfavourable-bad (U2), while the results of the 2018 monitoring indicate that the area of habitats with favourable conservation status increased to 80%. The remaining 20% of the area was assessed as U1. This means that there is no longer any area of target habitats with unfavourable-bad conservation status.

The success of the project had an immediate effect when one of the stakeholders received LIFE funding to restore a similar habitat complex within the same SAC (LIFE12 NAT/PL/000031 LIFE Military Habitats PL) and the methods developed in the project were successfully replicated there. The areas of inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330) and xeric sand calcareous grasslands (*6120) in the Pustynia Błędowska SAC cover respectively c. 6% of the national total of 6120 habitat and c. 4% of the national total of 2330 habitat in the Natura 2000 network in Poland. In terms of total area of 6120 habitat, the site is ranked third in the Polish SACs, and fifth for the 2330 habitat. Among these areas the Błędowska Desert is undoubtedly the best known and most spectacular example of Polish sand ecosystems. The conservation status of the 2330/6120 habitats complex clearly improved at the project end in relation to the status at the beginning of the project:

Table 31. Conservation status of the 2330/6120 habitats complex before and after the project

Habitat	Area before project (t1)	Area at end of project (t2)	Area 5+ years after project (t3)
Complex of 2330 and 6120 habitats	Approx. 100 ha	Approx. 160 ha	178 ha
	Condition before project (t1)	Condition at end of project (t2)	Condition 5+ years after project (t3)
	U2 – 100%	FV – 31% U1 – 46% U2 – 23%	According to 2018 monitoring results: FV – 80% U1 – 20% (2019 monitoring report not yet available). Trend for the project area is improving.

At national level, in 2013 and 2019 (Article 17 reports), the conservation status of inland dunes with open *Corynephorus* and *Agrostis* grasslands (2330) was classed as unfavourable-inadequate (U1), while the trend for Poland was classed as stable. The other parameters in 2019 were structure and functions unfavourable-inadequate (U1) and future prospects favourable (FV).

At national level, the conservation status of xeric sand calcareous grasslands (*6120) is currently (Article 17 report 2019) classed as unfavourable-bad. The assessment is based on monitoring carried out on 60% of the sites in the region. In the 2013 report the assessment of conservation status was the same, but it resulted from the assessment of area (U2 – unfavourable-bad). Currently, ‘future prospects’ and ‘structure and functions’ are assessed as U2. In both reporting periods the trend in conservation status was assessed as deteriorating for this habitat type.

No invertebrate listed in Annexes II or IV of the Habitats Directive has been found yet in the project area despite the fact that a natural inventory of the area was taken. It would be worth repeating the study when favourable conservation status is achieved.

20. Replication of project best practice is important to increase impact

The project area of 'Butterflies CZ-SK' (LIFE09 NAT/CZ/000364), the White Carpathians in the Czech Republic and Slovakia, the Lower Carpathians in Slovakia and the Považský Inovec mountains in Slovakia, is the largest area of species-rich meadows in Central Europe, hosts very rich fauna and provides important refuges for rare and endangered invertebrate species. However, at the start of the project grassland and landscape management was not optimal.

The project aimed to protect non-forest habitats and butterfly species of Community and national importance by applying suitable management practice. This, in turn, would contribute to halting the loss of biodiversity and strengthening the Natura 2000 network. The project also aimed to test new agri-environment measures to enable inclusion of excluded areas under the agricultural subsidy scheme.

Ten threatened butterfly species were targeted (e.g. the Danube clouded yellow *Colias myrmidone* and large blue butterfly *Maculinea arion*) and 15 habitat types (e.g. 6510 lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*) and 6210 semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia)). Actions were also carried out to raise awareness about the conservation value of non-forest habitats.

Restoration management focused on scrub removal on overgrown meadows (c. 250 ha) and renewal of hedgerows (22.5 km). Management of 1,900 ha of grassland habitats was optimised according to the needs of the target butterfly species. The project allowed landowners and farmers to restore management to long-abandoned areas by also being informed about the ecological requirements of endangered insect species.

In the Czech part of the project, the needs of insect species are taken more into account when planning management and farmers are applying the new measures. In Slovakia, the public administrations manage the most valuable sites on their own. The project outcomes are gradually being integrated with official management plans of the nature reserves in the project area. The main benefit is the restoration of non-forest habitats in long-abandoned and overgrown areas.

The demonstration value lay in testing, introducing and promoting patchwork management which is essential for conservation of many butterfly species. It was the first project in the Czech and Slovak Republics implementing such an organizationally, financially and educationally intensive method of management. A new measure supported by the agri-environment scheme aimed at butterfly protection was proposed and tested by the project and adopted by the Czech Ministry of Agriculture. The scheme is used successfully across the whole Czech Republic on meadows with large blue butterflies as well as other butterfly species; it is applied on 120 ha within the project area and 2,453 ha in the whole Czech Republic.

One of the key aspects of project success was intensive communication with landowners. The coordinating beneficiary contacted about 1,200 owners and informed them about the value of their land and discussed possible ways of its maintenance - to do the measures themselves, to choose somebody for the management or to give consent for the measures to be implemented by the project team. Very good relationships were established and now 80% of the habitat management in the project area is being done by owners and tenants (about 150 people). The beneficiaries secured financing for the after-LIFE management from existing national and EU subsidy schemes and also from the new agri-environment measure focused on butterflies.

The impact of the project on the target species populations is difficult to assess for two reasons:

1. Lack of data. Only a few sites are monitored on the Czech side and more abundant species (*Euplagia quadripunctaria*, *Lycaena dispar*) were not monitored at all since the project. In Slovakia, there are more data but some species were also not monitored.
2. There is a significant negative impact of bad weather conditions in the last three years (extreme drought and mild winters) that has caused a decrease in populations of many insect species. However, populations of most of the target butterflies are more or less stable except *Colias myrmidone* which is still very low (only a few sites in Slovakia with few individuals). Several previously unknown sites for the target species were discovered during the project and they are now managed. The habitat of all target species was extended and improved significantly; thus, the project prepared conditions for improvement of the conservation status of the target species.

Table 32. Assessment of the population trend and conservation status of the target species in the Czech part of the project area (the information about the current status is not very reliable as it is based on incomplete and unsystematic data and there is a strong impact from the weather conditions)

Species		Before project	At the end of project	3 years after the project (2019)	National level - Cont. biogeographical region
<i>Colias myrmidone</i>	Population	U2	U2	U2	U2
	Habitat	U2	U2	U2	U2
	Overall	extinct	extinct	extinct	extinct
<i>Eriogaster catax</i>	Population	U2	U2 increase	U2 increase	U2
	Habitat	U2	U1	U1	U2
	Overall	U2	U2	U1	U2
<i>Euplagia quadripunctaria</i>	Population	FV	FV stable	FV stable?	FV
	Habitat	FV	FV	FV	FV
	Overall	FV	FV	FV	FV
<i>Lycaena dispar</i>	Population	FV	FV stable	FV stable?	FV
	Habitat	FV	FV	FV	FV
	Overall	FV	FV	FV	FV
<i>Maculinea arion</i>	Population	U2	U2 stable	U2 stable?	U2
	Habitat	U2	U2	U2	U2
	Overall	U2	U2	U2	U2
<i>Maculinea nausithous</i>	Population	U1	U1 decrease	U1 stable?	FV
	Habitat	FV	FV	FV	FV
	Overall	U1	U1	U1	U1
<i>Maculinea teleius</i>	Population	U2	U2 stable	U2 decrease?	U2
	Habitat	U2	U1	U1	U1
	Overall	U2	U2	U2	U2
<i>Parnassius mnemosyne</i>	Population	U2	U2 stable	U2 stable	U1
	Habitat	U2	U1	U1	U1
	Overall	U2	U2	U2	U1

Table 33. Assessment of the population trend and conservation status of the target species in the Slovak part of the project area:

Species	Before project	At the end of project	3 years after the project (2019)	National level - Alpine biogeographical region
<i>Colias myrmidone</i>	decrease	decrease	decrease	decrease
	U2	U2	U2	U2
<i>Eriogaster catax</i>	decrease	increase	stable	stable
	U1	FV	FV	U1
<i>Euplagia quadripunctaria</i>	stable	stable	stable	stable
	FV	FV	FV	U1

Species	Before project	At the end of project	3 years after the project (2019)	National level - Alpine biogeographical region
<i>Lycaena dispar</i>	decrease	increase	increase	stable
	U1	FV	FV	U1
<i>Maculinea arion</i>	decrease	stable	stable	stable
	U2	U2	U2	U1
<i>Maculinea nausithous</i>	decrease	increase	increase	unknown
	U1	U1	U1	U1
<i>Maculinea teleius</i>	decrease	increase	increase	stable
	U1	U1	U1	U1
<i>Parnassius apollo</i>	decrease	increase	increase	decrease
	U2	U1	FV	U1
<i>Parnassius mnemosyne</i>	decrease	stable	increase	stable
	U1	FV	FV	U1

No change in the conservation status due to the project could be detected at the national level. However, the use of the new agri-environment measure will probably lead to improvement of the conservation status of several species in the Czech Republic (it should be confirmed during the next monitoring period).

Measures applied (according to the classification of measures used in Article 17 reporting):

- CA04 Reinstate appropriate agricultural practices to address abandonment, including mowing, grazing, burning or equivalent measures
- CA05 Adapt mowing, grazing and other equivalent agricultural activities
- CS03 Improvement of habitat of species from the directives

Available data about the managed sites do not distinguish individual grassland habitats; the largest area has the habitat 6210 which is most affected by the project. No change of the area and condition of the target habitat could be detected at the national level.

