

European Red List of Butterflies

Compiled by Chris van Swaay, Annabelle Cuttelod, Sue Collins, Dirk Maes, Miguel López Munguira, Martina Šašić, Josef Settele, Rudi Verovnik, Theo Verstrael, Martin Warren, Martin Wiemers and Irma Wynhoff



European Red List of Butterflies

Compiled by Chris van Swaay, Annabelle Cuttelod, Sue Collins, Dirk Maes, Miguel López Munguira,
Martina Šašić, Josef Settele, Rudi Verovnik, Theo Verstrael, Martin Warren, Martin Wiemers
and Irma Wynhoff

Butterfly Conservation Europe
IUCN Species Programme
IUCN Regional Office for Pan-Europe

Published by IUCN (International Union for Conservation of Nature) and Butterfly Conservation Europe in collaboration with the European Union.

The designation of geographical entities in this book, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of IUCN, Butterfly Conservation or the European Union concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries. The views expressed in this publication do not necessarily reflect those of IUCN, Butterfly Conservation or European Union.

Citation: Van Swaay, C., Cuttelod, A., Collins, S., Maes, D., López Munguira, M., Šašić, M., Settele, J., Verovnik, R., Verstrael, T., Warren, M., Wiemers, M. and Wynhof, I. 2010. European Red List of Butterflies
Luxembourg: Publications Office of the European Union.

Cover design: Alastair Davies at Handshake Productions
Layout by: COMSENSE LLC.
Printed by: SOLPRINT, Mijas (Malaga)
Picture credits on cover page: Nickerl's Fritillary *Melitaea aurelia*, a meadow species classified as Near Threatened owing to serious decline in many countries. © Chris van Swaay, De Vlinderstichting/Dutch Butterfly Conservation

All photographs used in this publication remain the property of the original copyright holder (see individual captions for details). Photographs should not be reproduced or used in other contexts without written permission from the copyright holder.

Available from: Luxembourg: Publications Office of the European Union, <http://bookshop.europa.eu>
IUCN Publications Services, www.iucn.org/publications
A catalogue of IUCN publications is also available.

***Europe Direct is a service to help you find answers
to your questions about the European Union***

**Freephone number (*):
00 800 6 7 8 9 10 11**

(*) Certain mobile telephone operators do not allow access to 00 800 numbers or these calls may be billed.

More information on the European Union is available on the Internet (<http://europa.eu>).

Cataloguing data can be found at the end of this publication.

Luxembourg: Publications Office of the European Union, 2010

ISBN 978-92-79-14151-5
doi:10.2779/83897

© European Union, 2010

Reproduction of this publication for educational or other non-commercial purposes is authorised without prior written permission from the copyright holder, provided that the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission from the copyright holder.

Printed in Spain

The text of this book is printed on 115gsm environmentally-friendly paper.

Compilers

Chris van Swaay	Dutch Butterfly Conservation, Wageningen, The Netherlands
Annabelle Cuttelod	IUCN Species programme, Red List Unit, Cambridge
Sue Collins	Butterfly Conservation Europe, The Netherlands
Miguel López Munguira	Universidad Autónoma de Madrid, Spain
Dirk Maes	Research Institute for Nature and Forest (INBO), Belgium
Martina Šašić	Croatian Natural History Museum, Croatia
Josef Settele	Helmholtz Centre for Environmental Research – UFZ, Germany
Rudi Verovnik	Society for the Conservation and Study of Lepidoptera in Slovenia
Theo Verstrael	Dutch Butterfly Conservation, Wageningen, The Netherlands
Martin Warren	Butterfly Conservation, UK
Martin Wiemers	University of Vienna, Austria
Irma Wynhoff	Dutch Butterfly Conservation, Wageningen, The Netherlands

Partner organisations

Butterfly Conservation Europe
Butterfly Conservation, UK
Croatian Natural History Museum, Croatia
De Vlinderstichting / Dutch Butterfly Conservation, The Netherlands
Helmholtz Centre for Environmental Research – UFZ, Germany
Research Institute for Nature and Forest - INBO, Belgium
Society for the Conservation and Study of Lepidoptera in Slovenia
University of Vienna, Austria
Universidad Autónoma de Madrid, Spain
Bayerische Akademie für Naturschutz und Landschaftspflege - ANL, Germany
IUCN Species Programme
IUCN Regional Office for Europe



Data providers

Andorra		Jordi Dantart
Austria	Austrian Society of Entomofaunistics (ÖGEF)	Helmut Höttinger
Belarus	Belarussian Entomological Society	Anatolij Kulak
Belgium (Flanders)	Butterfly Working Group of Natuurpunt	Dirk Maes
Belgium (Wallonia)	Wallonie OFFS	Violaine Fichet
Bosnia & Herzegovina	Faculty of Science, Department for Biology, University of Sarajevo	Suvad Lelo
Bulgaria	National Museum of Natural History, Bulgarian Academy of Sciences	Stoyan Beshkov
Croatia	Croatian Natural History Museum	Iva Mihoci
Cyprus	Cyprus Butterfly Recording Scheme	Eddie John
Czech Republic	Biological Centre of the Czech Academy of Sciences	Martin Konvicka
Czech Republic	Biological Centre of the Czech Academy of Sciences	Jiří Beneš,
Czech Republic	Biological Centre of the Czech Academy of Sciences	Pavel Kepka
Denmark	Danish Entomological Society	Michael Kavin
Estonia	Estonian Lepidopterists Society	Toomas Tammaru
Finland	Finnish Lepidopterological Society	Jasko Kullberg
France	National Museum of Natural History	Luc Manil
Germany	Helmholtz Centre for Environmental Research - UFZ	Josef Settele
Germany	Bavarian Academy for Nature and Landscape Conservation (ANL)	Christian Stettmer
Greece	Hellenic Zoological Society	Kelly Papapavlou
Hungary	Hungarian Society of LepidopteroLOGY	Ádám Kőrösi
Hungary	Hungarian Society of LepidopteroLOGY	Safian Szabolcs
Iceland	Zoological Museum	Erling Olafsson
Ireland	Dublin Naturalists' Field Club	David Nash
Italy	Zoological Union of Italy	Emilio Balletto
Italy	Zoological Union of Italy	Simona Bonelli
Italy	Zoological Union of Italy	Dario Patricelli
Latvia	Latvian Museum of Natural History	Nikolaj Savenkov
Liechtenstein	Büro OeGDI	Eyolf Aistleitner
Lithuania	Lithuanian Entomological Society	Giedrius Svitra
Lithuania	Lithuanian Entomological Society	Dalius Dapkus
Luxembourg	Natural History Museum	Marc Meyer
Macedonia	Butterfly Study Group (BSG)	Branko Micevski
Malta	University of Malta	Louis Cassar
Netherlands	Dutch Butterfly Conservation	Chris van Swaay
Norway	Norwegian Biodiversity Network (SABIMA)	Christian Steel
Poland	Association for Butterfly Conservation (TOM)	Marcin Sielezniew
Portugal	Tagis	Patricia Garcia Pereira
Portugal	Tagis	Ernestino Maravalhas
Romania	Focal Centre for Biodiversity Monitoring and Conservation	Sergiu Mihut
Russia	Russian Entomological Society	Alexey L. Devyatkin
Serbia	Ministry of Environment and Spatial Planning	Predrag Jakšić
Slovakia	Institute of Landscape Ecology, Slovak Academy of Sciences	Henrik Kalivoda
Slovakia	Institute of Landscape Ecology, Slovak Academy of Sciences	Miroslav Kulfan
Slovenia	Society for the Conservation and Study of Lepidoptera in Slovenia	Rudi Verovnik
Spain	Universidad Autónoma de Madrid	Miguel López Munguira
Spain	Universidad Autónoma de Madrid	Helena Romo
Spain	Universidad Autónoma de Madrid	Enrique García-Barros
Spain (+ Andorra)	Catalonia Butterfly Monitoring Scheme	Constantí Stefanescu
Spain (Canary Islands)	University of Vienna	Martin Wiemers
Sweden	Department of Natural Sciences, University of Gävle	Nils Ryrholm
Switzerland	Swiss Butterfly Conservation	Goran Dusej
Switzerland	Swiss Butterfly Conservation	Gilles Carron †
Turkey	Doga Koruma Merkezi (DKM)	Evrin Karaçetin
Ukraine	Alexanor	Sergey Popov
United Kingdom	Butterfly Conservation (UK)	Martin Warren

Table of contents

Foreword	vi
Acknowledgements	vii
Executive summary	viii
1. Background	1
1.1 The European context	1
1.2 European butterflies: diversity and endemism	1
1.3 Threatened status of species	3
1.4 Objectives of the assessment	4
2. Assessment methodology	6
2.1 Global and regional assessments	6
2.2 Geographic scope	6
2.3 Taxonomic scope	7
2.4 Preliminary assessments	7
2.5 Review workshop and evaluation of the assessments	8
3. Results	9
3.1 Threatened status of butterflies in Europe	9
3.2 Status by taxonomic group	13
3.3 Spatial distribution of species	13
3.3.1 Species richness	13
3.3.2 Threatened species richness	15
3.3.3 Endemic species richness	15
3.4 Major threats to butterflies in Europe	16
3.5 Demographic trends	18
4. Conservation measures	19
4.1 Protection of habitats and species in Europe	19
4.2 Protection of habitats and species in the EU27	19
4.3 Conservation management of butterflies in the EU	21
4.4 Extinction risk versus conservation status	21
4.5 Red List versus priority for conservation action	22
5. Conclusion and recommendations	23
5.1 Overview and recommendations for conservation measures	23
5.2 Application of project outputs	24
5.3 Future work	24
References	25
Appendix 1. Form filled by Butterfly Conservation Europe national focal points	27
Appendix 2. Red List status of European butterflies	30
Appendix 3. Methodology for spatial analyses	41
Appendix 4. Example species summary and distribution map	42

Foreword



Europe is a continent rich in natural and cultural heritage, with a diverse range of habitat conditions from dry Mediterranean maquis in the south to the Arctic tundra of the far north. Possibly more than

anywhere else in the world the European landscapes have been changed by human activities so that now the continent is covered with a mosaic of natural and semi-natural habitats surrounding urbanized areas. Although bringing higher diversity, this modification has obviously also placed great pressures on our wildlife and natural areas.

In 2001, EU Member States made the commitment to halt the loss of biodiversity within the EU by 2010. The EU Biodiversity Action Plan, adopted in 2006, sets out the main targets and activities needed to achieve this commitment. The Mid Term Review of the implementation of the Biodiversity Action Plan published by the Commission in December 2008 demonstrates that, despite some progress made, it is highly unlikely that the 2010 target will be met. Numerous scientific studies show that biodiversity in Europe has been declining rapidly for some time during periods of expansion and intensification of land use. The recent extensive reporting process under Article 17 of the EU Habitats Directive underlines this fact as most species and habitats protected under the Habitats Directive are still not under a favourable conservation status.

Red Lists are another important tool to scientifically assess and communicate the status of species. They usefully complement the reporting under the Habitats Directive as they address all species in a specific taxonomic group, not just those protected by the EU nature legislation. They hence give important complementary information about the situation of

biodiversity in Europe. This comprehensive assessment of all European butterflies provides an overview of the conservation status of this important insect group. It has followed the Red List methodology developed by the International Union for Conservation of Nature (IUCN), which is the most common methodology used throughout the world.

This study shows us that nearly 9% of butterflies are threatened and a further 10% are Near Threatened. These figures represent minimum estimates as trends are poorly known in many countries, especially eastern European countries which account for a large part of the territory. Despite this limitation, the results show that almost a third (31%) of the butterflies have significantly declining populations. Unfortunately, the drivers for these declines are mostly still in place. The loss and decline of their habitat poses the main threat, either in relation to intensification of agriculture or abandonment of land.

What can we as Europeans do about this? First and foremost, we need to fully implement the existing European legislation. The EU Habitats and Birds Directives are the main pieces of legislation ensuring the protection of Europe's nature. The Natura 2000 network of protected sites and the efforts to conserve and restore biodiversity in the wider countryside are helping to guarantee its future conservation and sustainable use. However, additional efforts are required to conserve butterflies in Europe, such as managing our grasslands in a more sustainable way (e.g. taking species needs into account in the timing of actions) and foster traditional patterns of agriculture.

I hope that this European Red List for butterflies will add another piece of evidence for the fact that efforts aimed at halting the loss of biodiversity and the implementation of related European legislation need a major boost in the coming years.

Ladislav Miko
Director
Directorate B: Nature
Directorate General for Environment
European Commission

Acknowledgements

All of IUCN's Red Listing processes rely on the willingness of experts to contribute and pool their collective knowledge to make the most reliable estimates of species status. Without their enthusiastic commitment to species conservation, this kind of regional overview would not be possible.

Coordination of the European Red List of Butterflies was carried out by Helen Temple and Annabelle Cuttelod (IUCN Species Programme). Chris van Swaay (Butterfly Conservation Europe) coordinated the compilation of data and the assessments of European butterfly species. Chris van Swaay and Irma Wynhoff wrote the texts on range and habitat requirements.

Jean-Christophe Vié provided guidance, encouragement, and good advice throughout the project. Ana Nieto, Teresa Oliveros Martinez, Anna Rosenberg and Hugo Ruiz Lozano provided substantial assistance with financial management of the project. Susannah Ohanlon, Vineet Katariya and Jim Ragle provided high-quality support on GIS and database issues. Resit Akçakaya provided guidance on how best to take into account data uncertainty.

Christian Stettmer organized the evaluation workshop. We would like to thank our host organisation, the Bayerische Akademie für Naturschutz und Landschaftspflege, for the logistical arrangements, for their warm hospitality and for ensuring that the workshop ran smoothly.

Data were provided by Butterfly Conservation Europe national partners and we would like to thank in particular the following people for their major contribution to this project: Eyjolf Aistleitner, Emilio Balletto, Jiří Beneš, Stoyan Beshkov, Simona Bonelli, Gilles Carron †, Louis Cassar, Sue Collins, Garry Curtis, Jordi Dantart, Dalius Dapkus, Alexey Devyatkin, Marta Domènech Ferrés, Goran Dusej, Cécile Edelist, Violaine Fichet, Patricia Garcia Pereira, Enrique García-Barros, Helmut Höttinger, Predrag Jakšić, Eddie John, Henrik Kalivoda, Evrim Karaçetin, Michael Kavin, Pavel Kepka, Martin Konvicka, Ádám Kőrösi, Anatolij Kulak, Miroslav Kulfan, Jasko Kullberg, Alexey L. Devyatkin,

Suvad Lelo, Miguel López Munguira, Dirk Maes, Luc Manil, Ernestino Maravalhas, Marc Meyer, Branko Micevski, Sergiu Mihut, Yeray Monasterio, David Nash, Erling Olafsson, Lars Ove Hansen, Kelly Papapavlou, Dario Patricelli, Sergey Popov, Helena Roma, Nils Ryrholm, Martina Šašić, Nikolaj Savenkov, Josef Settele, Marcin Sielezniew, Christian Steel, Constantí Stefanescu, Christian Stettmer, Giedrius Svitra, Safian Szabolcs, Toomas Tammuru, Chris van Swaay, Rudi Verovnik, Theo Verstrael, Martin Warren, Martin Wiemers, Irma Wynhoff.

Assessments were then made by Chris van Swaay, Irma Wynhoff, Rudi Verovnik, Martin Wiemers, Miguel López Munguira, Dirk Maes, Martina Šašić, Theo Verstrael, Martin Warren and Josef Settele. They were discussed with the national and species experts during a workshop held in Laufen (Germany), in January 2009.

Butterfly taxonomy largely follows the 2010-revision of the Taxonomy Commission of Butterfly Conservation Europe, lead by Rudi Verovnik and Martin Wiemers, and comprised of Emilio Balletto, John Coustis, Ole Karsholt, Otakar Kudrna, Miguel López Munguira, Erik J. van Nieukerken and Niklas Wahlberg, with the administrative support of Albert Vliegthart.

We would also specially thank Owen Lewis (IUCN Butterfly Red List Authority) for his support and for his thorough review of the endemic species assessments in the very short deadline given.

The European Butterflies Assessments and consequently this report were requirements of the framework of a service contract with the European Commission (Service Contract No. 070307/2007/483305/MAR/B2). Additional financial support for the workshop was provided by the Bayerische Akademie für Naturschutz und Landschaftspflege. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the European Commission, Butterfly Conservation Europe, or the International Union for Conservation of Nature (IUCN).

Executive summary

Aim

The European Red List is a review of the conservation status of c. 6,000 European species (dragonflies, butterflies, freshwater fishes, reptiles, amphibians, mammals and selected groups of beetles, molluscs, and vascular plants) according to IUCN regional Red Listing guidelines. It identifies those species that are threatened with extinction at the regional level – in order that appropriate conservation action can be taken to improve their status. This Red List publication summarises results for European Butterflies.

Scope

All species of butterflies native to Europe are included, except those which are confined to the North Caucasus countries. The geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east, and from Franz Josef Land in the north to the Canary Islands in the south. The Caucasus region is not included. Red List assessments were made at two regional levels: for geographical Europe, and for the 27 current Member States of the European Union.

Status assessment

The status of all species was assessed using the IUCN Red List Criteria (IUCN 2001), which are the world's most widely accepted system for measuring extinction risk. All assessments followed the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2003). These assessments were compiled from information from a network of over 50 compilers from almost every country and reviewed during a workshop held in Laufen (Germany) and through discussions and correspondence with relevant experts. Assessments are available on the European Red List website and data portal: <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>.

Butterflies in Europe

Butterflies are beautiful insects and easy to recognise. They lay eggs that hatch into caterpillars, which then turn into chrysalises before becoming adults. They have very

specific food and habitat requirements that differ in each stage of their life cycle. In Europe, there are 482 species of butterflies, 451 of them being also found in the 27 member states of the EU. Almost a third of these species (142 species) are endemic to Europe (which means that they are unique to Europe and are found nowhere else in the world). Forty-one species occur only marginally on the European continent, while one species has been introduced in the 1980s, all of them are considered as Not Applicable in this assessment. The highest diversity of butterflies is found in mountainous areas in southern Europe, mainly in the Pyrenees, the Alps and the mountains of the Balkans, where numerous restricted-range species are encountered.

Results

Overall, about 9% of European butterflies are threatened in Europe, and 7% are threatened at the EU27 level. A further 10% of butterflies are considered Near Threatened. The figures for butterflies represent minimum estimates as trends are poorly known in many countries, including some large eastern European countries that comprise large parts of the study region. By comparison, 23% of the amphibians, 19% of the reptiles, 15% of the mammals and the dragonflies, 13% of the birds and 11% of the saproxylic beetles are threatened at the European level (Temple & Cox 2009, Cox & Temple, 2009, Temple & Terry 2007, Kalkman *et al.* 2010, BirdLife International 2004a, Nieto & Alexander 2010). No other groups have yet been comprehensively assessed at the European level. Despite the lack of good trend data in some countries, the study shows that about a third (31%) of the European butterflies has declining populations, while 4% are increasing and more than half of the species are stable. For the remaining 10%, the current information is too limited to define their overall population trend.

Most of the threatened species are confined to parts of southern Europe. The main current threat to European butterflies is the loss of their habitat or habitat connectivity due to the changes in agricultural practices, either through intensification or abandonment. Other important threats are climate change, increased frequency and intensity of fires and tourism development.

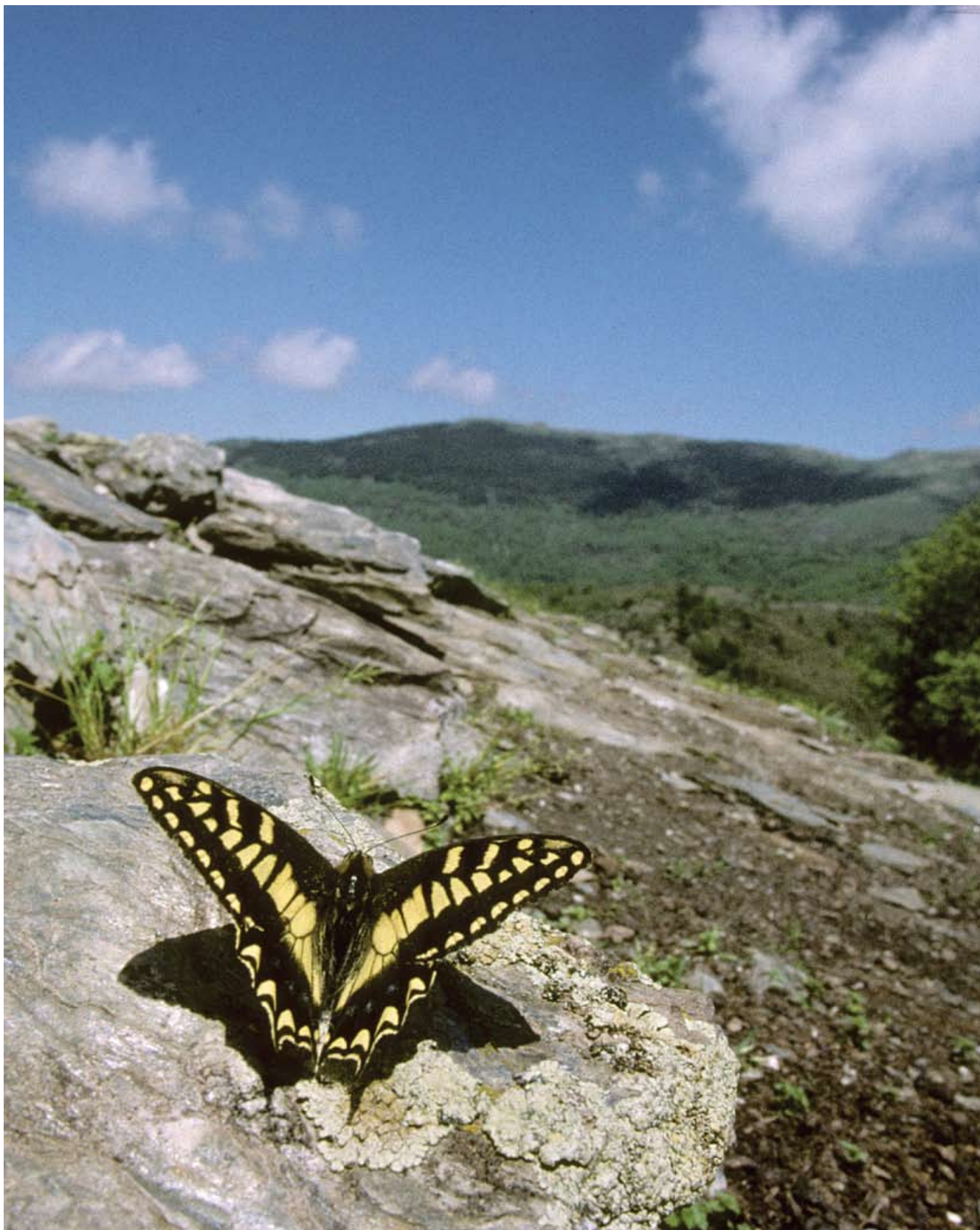
Conclusions

- Butterflies are important biodiversity indicators and play an important role in ecosystems, e.g. through their pollination activities.
 - Despite a lack of good trend data from many countries, the results show that about a third of European butterfly species experienced a decline in their populations over the last 10 years and 9% are threatened.
 - It should be noted that both the distribution and population size of numerous species have declined severely during the 20th century (but not in the time frame of 10 years or three generations taken into consideration by IUCN methodology), especially in Western Europe. In some cases the few remaining populations in these countries are nowadays stable as a result of conservation measures, which means these species do not occur in the list of threatened species.
 - Further conservation actions are therefore needed urgently to improve the status of European butterflies. While some threatened species already receive some protection and conservation actions, others currently receive little or no attention.
 - This report highlights where the highest diversity, highest level of endemism and highest portion of threatened butterflies are found within the European region.
- The main long-term threat identified is the loss and degradation of suitable habitat in relation to changes in land-use, in particular intensification of agriculture (especially of grazing) and abandonment of land, leading to invasion of shrub and trees.
 - Climate change is already having an impact on several butterfly species and is likely to have a strong effect on many more in the future.
 - In order to improve the conservation status of European butterflies and to reverse their decline, further conservation actions are urgently needed. In particular: ensuring the adequate protection and management of key butterfly habitats and their surrounding areas, drawing up Species Action Plans for the most threatened species, establishing monitoring programmes, improving land management policies such as the European Agricultural Policy, and revising national and European legislation, adding species identified as threatened where needed.
 - Monitoring programmes exist in only a small number of European countries and need to be established in all countries in order to determine objective population trends and improve the accuracy of red listing in future years. Such monitoring programmes would also help evaluate the impact of conservation measures on this important indicator group of insects.
 - This project contributes to improving the coverage of invertebrates on the global IUCN Red List, thanks to the assessment of endemic European butterflies.

Coenonympha phryne. A species from pristine steppes in Russia and Ukraine, Critically Endangered in Europe. Photograph © Vladimir Savchuk



Corsican Swallowtail *Papilio hospiton* (Least Concern). This large and impressive butterfly is endemic to Corsica and Sardinia, where it inhabits the rocky slopes of mountains. It is not currently thought to be threatened but should be monitored to assess future change. Photograph © Tom Nygaard Kristensen



1. Background

1.1 The European context

Europe is one of the seven traditional continents of the Earth, although physically and geologically it is the westernmost peninsula of Eurasia. Europe is bound to the north by the Arctic Ocean, to the west by the Atlantic Ocean, to the south by the Mediterranean Sea, and to the southeast by the Black Sea and the Caucasus Mountains. In the east, Europe is separated from Asia by the Ural Mountains and the Caspian Sea (see Figure 2 below). It is the world's second-smallest continent in terms of area, covering approximately 10,400,000 square kilometres (4,010,000 square miles) or 2% of the Earth's surface. In terms of human population, Europe is the third-largest continent (after Asia and Africa) with a population of some 731 million – about 11% of the world's population. Europe is the most urbanised and, together with Asia, the most densely populated continent in the world.

The European Union, comprising 27 Member States, is Europe's largest political and economic entity. It is the world's largest economy with an estimated GDP in 2008 of 18.9 trillion US dollars (Central Intelligence Agency 2009). Per-capita GDP in many EU states is among the highest in the world, and rates of resource consumption and waste production are correspondingly high – the EU 27's "ecological footprint" has been estimated to exceed the region's biological capacity (the total area of cropland, pasture, forest, and fishing grounds available to produce food, fibre and timber, and absorb waste) by 2.6 times (WWF 2007).

The EU's Member States stretch from the Arctic Circle in the north to the Mediterranean in the south, and from the Atlantic coast in the west to the Pannonian steppes in the east – an area containing a great diversity of landscapes and habitats and a wealth of flora and fauna. European biodiversity includes 488 species of birds (IUCN 2009), 260 species of mammals (Temple & Terry 2007 2009), 151 species of reptiles, 85 species of amphibians, 546 species of freshwater fishes (Kottelat & Freyhof 2007), 20-25,000 species of vascular plants¹ and well over 100,000 species of invertebrates (Fauna Europaea 2004). Mediterranean Europe is particularly rich in plant and animal species and has been recognised

as a global "biodiversity hotspot" (Mittermeier *et al.* 2004, Cuttelod *et al.* 2008).

Europe has arguably the most highly fragmented landscape of all continents, and only a tiny fraction of its land surface can be considered as wilderness. For centuries most of Europe's land has been used by humans to produce food, timber and fuel and provide living space, and currently in western Europe more than 80% of land is under some form of direct management (European Environment Agency 2007). Consequently, European species are to a large extent dependent upon semi-natural habitats created and maintained by human activity, particularly traditional, non-intensive forms of land management. These habitats are under pressure from agricultural intensification, urban sprawl, infrastructure development, land abandonment, acidification, eutrophication and desertification. Many species are directly affected by overexploitation, persecution and impacts of alien invasive species, as well as climate change being set to become an increasingly serious threat in the future. Europe is a huge, diverse region and the relative importance of different threats varies widely across its biogeographic regions and countries. Although considerable efforts have been made to protect and conserve European habitats and species (e.g. see Sections 4.1, 4.2, 4.3), biodiversity decline and the associated loss of vital ecosystem services (such as water purification, crop pollination, and carbon sequestration) continues to be a major concern in the region.

1.2 European butterflies: diversity and endemism

Butterflies are a large group of insects, belonging to the order "Lepidoptera", which means "scaly wing". They are characterized by their large, often colorful wings and by their proboscis, which they use to suck flower nectar. They lay eggs that hatch into larvae (called caterpillars), which have a totally different appearance to the adult, with a cylindrical body, and feeds mainly on plant leaves, before going through metamorphosis to form a chrysalis. The butterflies are a group of two closely related superfamilies of Lepidoptera which form a small fraction (ca. 5%) of European Lepidoptera. The

¹ Source: Euro+Med PlantBase, <http://www.emplantbase.org/home.html>



remaining species which belong to 29 superfamilies are colloquially referred to as moths, because most of them fly during the night.

This report only analyzes the conservation status of butterflies. Many butterflies are valued for their beauty, but they also have an economic interest and play an important role in ecosystems through pollination and as prey for other species. They support a wide range of parasitoids, many of which are specific to their host and worthy of conservation in their own right.

In Europe, there are 482 species of butterflies, divided into six families (Table 1): the largest one is the Nymphalidae, also called brush-footed butterflies, with often large and brightly-colored species, such as the fritillaries, admirals, emperors, and tortoiseshells; the subfamilies Libytheinae and Satyrinae were until recently a separate family, the latter including the large group of the browns, but are now part of the Nymphalidae; then the Lycaenidae, including the blues, the coppers and the hairstreaks, generally small brightly colored butterflies, sometimes with a metallic

gloss; the Pieridae, where the adults are mostly white or yellow with black spots; the Hesperiiidae, named skippers due to their quick and darting flight; the Papilionidae, or Swallowtail butterflies, which are, as their name suggests, often tailed like the forked tail of some swallows. Finally, there is one representative of the Riodinidae family whose members are mainly distributed in the Neotropical region: *Hamearis lucina*, the Duke of Burgundy Butterfly which is similar to the Fritillaries, although this family Riodinidae is closely related to the Lycaenidae. *Cacyreus marshalli*, a South African species that was introduced in the Balearic Islands in 1989 (Eitschberger & Stamer 1990) and is rapidly spreading across the Mediterranean and up to the Netherlands is not a native species and therefore not considered in this assessment.

Nearly one third (30%) of European butterflies are endemic, i.e. are found only in Europe. The family with the highest rate of endemism is the Nymphalidae, while the Papilionidae is a mainly tropical family, which explains the lower percentage of European endemics.

Table 1. Diversity and endemism in butterfly families in Europe*.

Class	Order	Family	Europe			EU27		
			Number of species	Number of endemic species	% of endemic species*	Number of species	Number of endemic species	% of endemic species*
Insecta	Lepidoptera	Hesperiidae	46	10	22%	44	3	7%
		Riodinidae	1	0	0%	1	0	0%
		Lycaenidae	129	31	25%	123	24	19%
		Nymphalidae	237	86	36%	219	40	18%
		Papilionidae	13	2	15%	12	2	17%
		Pieridae	56	13	23%	52	9	17%
Total			482	142	30%	451	78	17%

* This table includes species that are native or were naturalised before AD 1500; species introduced after this date are not included. Species of marginal occurrence in Europe and/or the EU are included. For the EU 27 assessment the Not Evaluated species (species which do not occur in the EU and that represent a total of 27 species) are excluded.

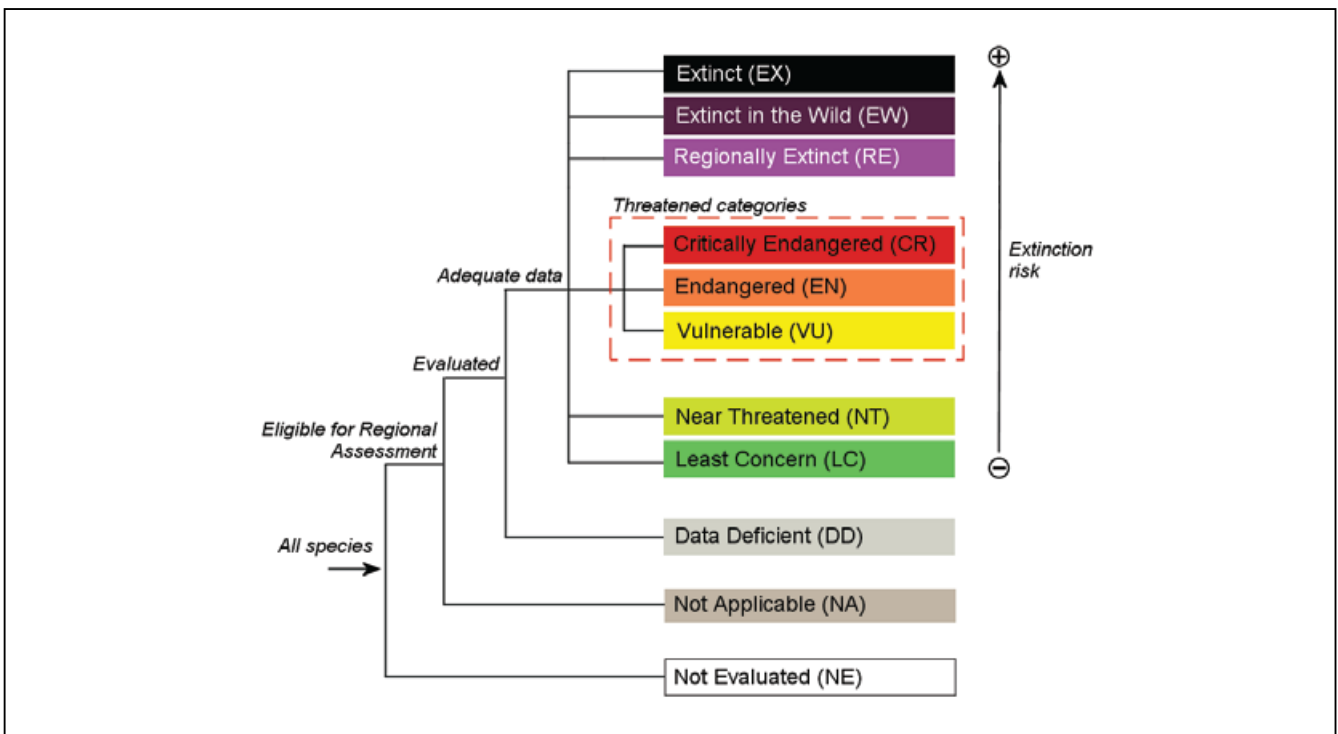
The Duke of Burgundy *Hamearis lucina* (Least Concern) is the only member of the family Riodinidae (metalmarks) in Europe which is closely related to the Blues (Lycaenidae). The butterflies are often found on meadows with scrub or near woods where their major foodplant, Primulas, are present. Although it is declining in many countries and remains a conservation priority, it is classed as Least Concern because its overall decline is less than 30% in the last 10 years.. Photograph © Martin Wiemers



1.3 Threatened status of species

The conservation status of plants and animals is one of the most widely used indicators for assessing the condition of ecosystems and their biodiversity. It also provides an important tool in establishing priorities for species conservation. At the global scale, the best source of information on the conservation status of plants and animals is the *IUCN Red List of Threatened Species* (see www.iucnredlist.org; IUCN 2009). The Red List is designed to determine the relative risk of extinction, with the main purpose of cataloguing and highlighting those taxa that are facing a higher risk of extinction. It provides taxonomic, conservation status, and distribution information on taxa that have been evaluated using the *IUCN Red List Categories and Criteria: Version 3.1* (IUCN 2001). There are nine Categories, ranging from Least Concern, for species that are not threatened, to the Extinct category, for species that have disappeared from the planet. The IUCN Red List Categories are based on a set of quantitative criteria linked to population trends, population size and structure, and geographic range. Species classified as Vulnerable, Endangered and Critically Endangered are considered as ‘threatened’. When conducting regional or national assessments, two additional categories are used (Regionally Extinct and Not Applicable) for non-native species (IUCN 2003) (Figure 1).

Figure 1. IUCN Red List Categories at regional scale



1.4 Objectives of the assessment

The European regional assessment has four main objectives:

- To contribute to regional conservation planning through provision of a baseline dataset reporting the status of European butterflies.
- To identify those geographic areas and habitats needing to be conserved to prevent extinctions and to ensure that European butterflies reach and maintain a favourable conservation status.
- To identify the major threats and to propose mitigating measures and conservation actions to address them.
- To strengthen the network of experts focused on conservation of butterflies in Europe, so that the assessment information can be kept current, and expertise can be targeted to address the highest conservation priorities.

The assessment provides three main outputs:

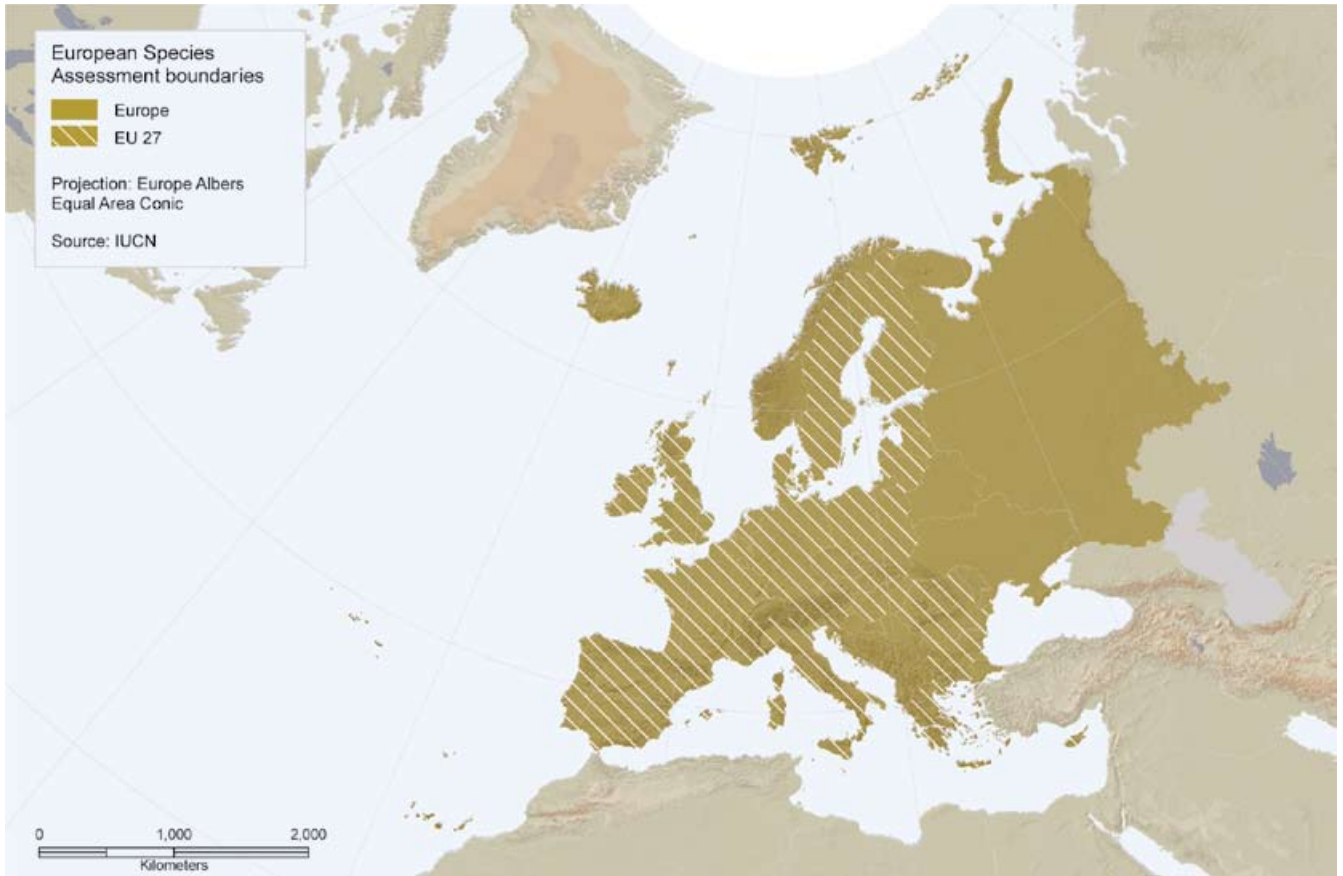
- This summary report on the status and distribution of European butterflies; their main threats and recommendations for conservation measures, as well as a poster on their status.
- A freely available database holding the baseline data for monitoring the status and distribution of European butterflies;
- A website and data portal (<http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>) showcasing this data in the form of species factsheets for all European butterflies, along with background and other interpretative material;

The data presented in this report provides a snapshot based on knowledge available at the time of writing. The database will continue to be updated and made freely and widely available. IUCN will ensure wide dissemination of this data to relevant decision makers, NGOs and scientists to inform the implementation of conservation actions on the ground.

The Lesser Spotted Fritillary *Melitaea trivia* is one of the most colorful fritillaries in Europe. Although considered Least Concern in Europe, the populations within the EU-27 countries show a marked decline. For this reason this butterfly is considered Near Threatened in the EU-27. Photograph © Chris van Swaay



Figure 2. Regional assessments were made for two areas – geographical Europe and the EU 27



On some locations the males of blues can come together to drink water and minerals, like here in Northern Hungary. Photograph © Chris van Swaay



2. Assessment methodology

2.1 Global versus regional assessment

The extinction risk of a species can be assessed at global, regional or national level. One species can have a different category in the Global Red List and a Regional Red List. For example, a species that is common worldwide and classed as Least Concern (LC) in the Global Red List could face a high level of threat and fit the Endangered category (EN) in a particular region (see Figure 1 for the explanation of the IUCN categories). In order to avoid an over- or underestimation of the regional extinction risk of a species, the *Guidelines for the application of IUCN Red List Criteria at Regional Level* should be applied (IUCN 2003). Logically, an endemic species should have the same category at regional and global level, as it is not present in any other part of the world.

2.2 Geographic scope

The geographical scope is continent-wide, extending from Iceland in the west to the Urals in the east (including European parts of the Russian Federation), and from Franz Josef Land in the north to the Mediterranean in the south (see Figure 2). The Canary Islands, Madeira and the Azores were also included. In the southeast, where definitions of Europe are most contentious, the Caucasus region was not included.

Red List assessments were made at two regional levels: 1) for geographical Europe (limits described above); and 2) for the area of the 27 Member States of the European Union.

The Two-tailed Pasha *Charaxes jasius* is confined to the Mediterranean region where it breeds on Strawberry Trees *Arbutus unedo*. Although not currently threatened, models predict that it could be very badly affected by climate change. Photograph © Chris van Swaay



Table 2. Butterflies species of marginal occurrence or introduced to Europe after AD 1500.

Family	Genus	Species
HESPERIIDAE	<i>Borbo</i>	<i>borbonica</i>
HESPERIIDAE	<i>Carcharodus</i>	<i>stauderi</i>
HESPERIIDAE	<i>Pelopidas</i>	<i>thrax</i>
LYCAENIDAE	<i>Apharitis</i>	<i>acamas</i>
LYCAENIDAE	<i>Azanus</i>	<i>ubaldus</i>
LYCAENIDAE	<i>Cacyreus</i>	<i>marshalli</i>
LYCAENIDAE	<i>Callophrys</i>	<i>chalybeitincta</i>
LYCAENIDAE	<i>Callophrys</i>	<i>suaveola</i>
LYCAENIDAE	<i>Chilades</i>	<i>galba</i>
LYCAENIDAE	<i>Lycaena</i>	<i>thetis</i>
LYCAENIDAE	<i>Plebejus</i>	<i>loewii</i>
LYCAENIDAE	<i>Plebejus</i>	<i>eurypilus</i>
LYCAENIDAE	<i>Polyommatus</i>	<i>damone</i>
LYCAENIDAE	<i>Polyommatus</i>	<i>cyane</i>
LYCAENIDAE	<i>Polyommatus</i>	<i>iphigenia</i>
LYCAENIDAE	<i>Praephilotes</i>	<i>anthracias</i>
LYCAENIDAE	<i>Pseudophilotes</i>	<i>panope</i>
LYCAENIDAE	<i>Satyrium</i>	<i>ledereri</i>
LYCAENIDAE	<i>Tongeia</i>	<i>fischeri</i>
LYCAENIDAE	<i>Zizeeria</i>	<i>karsandra</i>
LYCAENIDAE	<i>Zizeeria</i>	<i>knysna</i>
NYMPHALIDAE	<i>Boloria</i>	<i>alaskensis</i>
NYMPHALIDAE	<i>Boloria</i>	<i>angarensis</i>
NYMPHALIDAE	<i>Boloria</i>	<i>tritonina</i>
NYMPHALIDAE	<i>Boloria</i>	<i>oscarus</i>
NYMPHALIDAE	<i>Coenonympha</i>	<i>amaryllis</i>
NYMPHALIDAE	<i>Danaus</i>	<i>plexippus</i>
NYMPHALIDAE	<i>Danaus</i>	<i>chrysippus</i>
NYMPHALIDAE	<i>Erebia</i>	<i>cyclopius</i>
NYMPHALIDAE	<i>Erebia</i>	<i>jeniseiensis</i>
NYMPHALIDAE	<i>Erebia</i>	<i>dabanensis</i>
NYMPHALIDAE	<i>Erebia</i>	<i>edda</i>
NYMPHALIDAE	<i>Erebia</i>	<i>fasciata</i>
NYMPHALIDAE	<i>Erebia</i>	<i>rossii</i>
NYMPHALIDAE	<i>Hipparchia</i>	<i>mersina</i>
NYMPHALIDAE	<i>Hyponephele</i>	<i>huebneri</i>
NYMPHALIDAE	<i>Issoria</i>	<i>eugenia</i>
NYMPHALIDAE	<i>Lopinga</i>	<i>deidamia</i>
NYMPHALIDAE	<i>Maniola</i>	<i>megala</i>
NYMPHALIDAE	<i>Oeneis</i>	<i>melissa</i>
NYMPHALIDAE	<i>Oeneis</i>	<i>polixenes</i>
NYMPHALIDAE	<i>Oeneis</i>	<i>magna</i>
NYMPHALIDAE	<i>Vanessa</i>	<i>virginiensis</i>
NYMPHALIDAE	<i>Ypthima</i>	<i>asterope</i>
PAPILIONIDAE	<i>Zerynthia</i>	<i>caucasica</i>
PIERIDAE	<i>Catopsilia</i>	<i>florella</i>
PIERIDAE	<i>Colotis</i>	<i>evagore</i>
PIERIDAE	<i>Zegris</i>	<i>pyrothoe</i>

2.3 Taxonomic scope

All butterflies species native to Europe or naturalised before AD 1500 were included in the assessment. Forty-seven species that are of marginal occurrence in Europe were considered in this assessment, but were classed as Not Applicable (Table 2). An additional species has been introduced in Europe in the late 1980s and is also considered as Not Applicable.

Butterfly taxonomy largely follows the 2010-revision of the Taxonomy Commission of Butterfly Conservation Europe, lead by Rudi Verovnik and Martin Wiemers and comprised of Emilio Balletto, John Coutsis, Ole Karsholt, Otakar Kudrna, Miguel López Munguira, Erik J. van Nieukerken and Niklas Wahlberg.

Distinct subspecies were not individually assessed as part of this project.

2.4 Preliminary assessments

Data were gathered through a questionnaire sent to all national focal points of Butterfly Conservation Europe (see Annex 1), asking these specialists to review the species data for their country. These data were compiled to update the Butterfly Conservation Europe database and preliminary assessments were made for each species through a working group of ten experts (Chris van Swaay, Irma Wynhoff, Rudi Verovnik, Martin Wiemers, Miguel López Munguira, Dirk Maes, Martina Šašić, Theo Verstrael, Martin Warren, Josef Settele).

The following data were entered into the database:

- Species' taxonomic classification
- Geographic range (including a distribution map)
- Red List Category and Criteria
- Population information
- Habitat preferences
- Major threats
- Conservation measures
- Other general information
- Key literature references

2.5 Review workshop and evaluation of assessments

A workshop with 50 national and species experts was organised on 28-29 January 2009 in Laufen (Germany) to review the preliminary assessments on a biogeographical basis. Preliminary species summary reports were distributed to all the participants before the review workshop to allow them to check the data presented and prepare any changes to the data. The preliminary assessments were reviewed during the workshop and new information was added to the species summaries and maps. Red List Categories were then defined for each species at the European and EU 27 levels.

In August 2009, a meeting was held in Ankara (Turkey) between Resit Akçakaya, Chris van Swaay and several

members of Butterfly Conservation Europe in order to discuss how to take into consideration uncertainty in the data analysis and in the resulting Red List categories. Following this meeting, the butterflies assessments were reviewed once again and adjustments were made.

Following the review workshop and the uncertainty discussion, the data were edited, and outstanding questions were resolved through communications with the experts. Consistency in the use of IUCN Criteria was checked by IUCN staff from the IUCN Red List Unit. The resulting finalised IUCN Red List assessments are a product of scientific consensus concerning species status and are backed by relevant literature and data sources.

Expert participants at the Butterfly Red List workshop, January 2009, Laufen, Germany. Photograph © Chris van Swaay



3. Results and discussion

3.1 Threatened status of butterflies

The status of butterflies was assessed at two regional levels: geographical Europe and the EU27. At the European level, 8.5% of the species (37 species) are considered as threatened, with 0.7% of them being Critically Endangered, 2.8% Endangered and 5% Vulnerable (Table 3 and Figure 3 and 4). A further 10% (44 species) of species are classified as Near Threatened. Most of these are declining rapidly in parts of their range and are in urgent need of conservation action. Within the EU27, 7.1% of the butterflies (30 species) are threatened with extinction, of which 0.5% are Critically Endangered, 2.1% Endangered and 4.5% Vulnerable. In addition,

11.2% of species are considered as Near Threatened. One species is Regionally Extinct at the European level (*Aricia hyacinthus*) and an additional one is Regionally Extinct at the EU27 level: *Tomares nogelii* disappeared from Romania and Moldova before 1999, but still occurs in Ukraine. The Madeiran Large White (*Pieris wollastoni*), restricted to the island of Madeira (Portugal), has not been reported since 1986 despite several visits of lepidopterists to its former habitat (Gardiner 2003; B. de Sousa, *pers. comm.* & P. Russell, *pers. comm.*). It is therefore considered as Critically Endangered (Possibly Extinct). Species classed as Regionally Extinct and threatened (Critically Endangered, Endangered and Vulnerable) at the European and EU 27 level are listed in Table 4.

Table 3. Summary of numbers of European butterflies species within each category of threat

	IUCN Red List categories	No. species Europe (no. endemic species)	No. species EU 27 (no. endemic species)
Threatened categories	Regionally Extinct (RE)	1	2
	Critically Endangered (CR)	3 (2)	2 (1)
	Endangered (EN)	12 (6)	9 (5)
	Vulnerable (VU)	22 (14)	19 (10)
	Near Threatened (NT)	44 (11)	47 (7)
	Least Concern (LC)	349 (107)	338 (54)
	Data Deficient (DD)	4 (2)	4 (1)
	Total number of species assessed*	435 (142)	421 (78)

* This table does not include the Not Applicable species in Europe and/or the EU (species introduced after AD 1500 or species of marginal occurrence). For the EU 27 assessment the Not Evaluated species (species which do not occur in the EU) are also excluded.

Figure 3. Red List status of butterflies in Europe

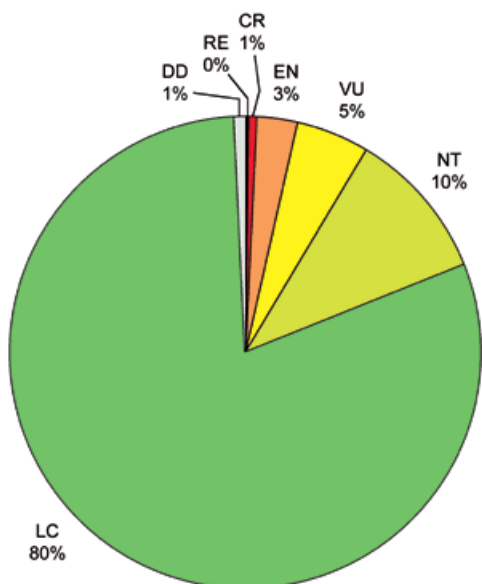


Figure 4. Red List status of butterflies in the EU27

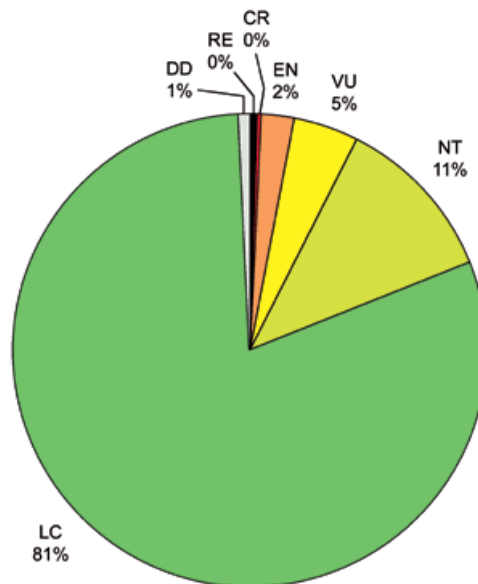


Table 4. Regionally Extinct, threatened or Near Threatened butterflies species at the European and EU27 level. Species endemic to Europe or to EU 27 are marked with an asterisk (*).

Family	Genus	Species	Common name	Red List status	
				Europe	EU27
LYCAENIDAE	<i>Aricia</i>	<i>hyacinthus</i>		RE	RE
PIERIDAE	<i>Pieris</i>	<i>wollastoni</i>	Madeira Large White	CR*	CR*
NYMPHALIDAE	<i>Coenonympha</i>	<i>phryne</i>		CR	NE
NYMPHALIDAE	<i>Pseudochazara</i>	<i>cingovskii</i>	Macedonian Grayling	CR*	NE
PIERIDAE	<i>Colias</i>	<i>myrmidone</i>	Danube Clouded Yellow	EN	CR
LYCAENIDAE	<i>Lycaena</i>	<i>helle</i>	Violet Copper	EN	LC
LYCAENIDAE	<i>Phengaris</i>	<i>arion</i>	Large Blue	EN	EN
LYCAENIDAE	<i>Plebejus</i>	<i>zulichii</i>	Zulich's Blue	EN*	EN*
LYCAENIDAE	<i>Polyommatus</i>	<i>humedasaе</i>	Piedmont Anomalous Blue	EN*	EN*
LYCAENIDAE	<i>Turanana</i>	<i>taygetica</i>	Odd-spot Blue	EN	EN
NYMPHALIDAE	<i>Boloria</i>	<i>improba</i>	Dusky-winged Fritillary	EN	EN
NYMPHALIDAE	<i>Coenonympha</i>	<i>oedippus</i>	False Ringlet	EN	LC
NYMPHALIDAE	<i>Pararge</i>	<i>xiphia</i>	Madeira Speckled Wood	EN*	EN*
PIERIDAE	<i>Gonepteryx</i>	<i>maderensis</i>	Madeira Brimstone	EN*	EN*
PIERIDAE	<i>Pieris</i>	<i>cheiranthi</i>	Canary Islands Large White	EN*	EN*
NYMPHALIDAE	<i>Pseudochazara</i>	<i>euxina</i>		EN*	NE
LYCAENIDAE	<i>Tomares</i>	<i>nogelii</i>	Nogel's Hairstreak	VU	RE
HESPERIIDAE	<i>Pyrgus</i>	<i>cirsii</i>	Cinquefoil Skipper	VU*	VU
LYCAENIDAE	<i>Phengaris</i>	<i>teleius</i>	Scarce Large Blue	VU	VU
LYCAENIDAE	<i>Polyommatus</i>	<i>galloi</i>	Higgin's Anomalous Blue	VU*	VU*
LYCAENIDAE	<i>Polyommatus</i>	<i>golgus</i>	Sierra Nevada Blue	VU*	VU*
LYCAENIDAE	<i>Polyommatus</i>	<i>orphicus</i>		VU*	VU*
LYCAENIDAE	<i>Polyommatus</i>	<i>violetae</i>	Andalusian Anomalous Blue	VU*	VU*
NYMPHALIDAE	<i>Boloria</i>	<i>polaris</i>	Polar Fritillary	VU	VU
NYMPHALIDAE	<i>Coenonympha</i>	<i>hero</i>	Scarce Heath	VU	VU
NYMPHALIDAE	<i>Erebia</i>	<i>christi</i>	Raetzer's Ringlet	VU*	VU
NYMPHALIDAE	<i>Erebia</i>	<i>sudetica</i>	Sudeten Ringlet	VU*	VU
NYMPHALIDAE	<i>Hipparchia</i>	<i>bacchus</i>	El Hierro Grayling	VU*	VU*
NYMPHALIDAE	<i>Hipparchia</i>	<i>tilosi</i>	La Palma Grayling	VU*	VU*
NYMPHALIDAE	<i>Lopinga</i>	<i>achine</i>	Woodland Brown	VU	VU
NYMPHALIDAE	<i>Pseudochazara</i>	<i>amymone</i>		VU*	VU*
NYMPHALIDAE	<i>Pseudochazara</i>	<i>orestes</i>	Dils' Grayling	VU*	VU*
PIERIDAE	<i>Colias</i>	<i>chrysothème</i>	Lesser Clouded Yellow	VU	VU
PIERIDAE	<i>Euchloe</i>	<i>bazae</i>	Spanish Greenish Black-tip	VU*	VU*
PIERIDAE	<i>Gonepteryx</i>	<i>cleobule</i>	Canary Brimstone	VU*	VU*
NYMPHALIDAE	<i>Coenonympha</i>	<i>tullia</i>	Large Heath	VU	NT
NYMPHALIDAE	<i>Euphydryas</i>	<i>maturna</i>	Scarce Fritillary	VU	LC
NYMPHALIDAE	<i>Coenonympha</i>	<i>orientalis</i>	Balkan Heath	VU*	DD
PIERIDAE	<i>Leptidea</i>	<i>morsei</i>	Fenton's Wood White	NT	EN
HESPERIIDAE	<i>Carcharodus</i>	<i>lavatherae</i>	Marbled Skipper	NT	NT
HESPERIIDAE	<i>Muschampia</i>	<i>cribrellum</i>	Spinose Skipper	NT	NT
HESPERIIDAE	<i>Thymelicus</i>	<i>acteon</i>	Lulworth Skipper	NT	NT
LYCAENIDAE	<i>Iolana</i>	<i>iolas</i>	Iolas Blue	NT	NT
LYCAENIDAE	<i>Phengaris</i>	<i>nausithous</i>	Dusky Large Blue	NT	NT
LYCAENIDAE	<i>Plebejus</i>	<i>dardanus</i>	Bosnian Blue	NT	NT
LYCAENIDAE	<i>Polyommatus</i>	<i>damon</i>	Damon Blue	NT	NT

Family	Genus	Species	Common name	Red List status	
				Europe	EU27
LYCAENIDAE	<i>Polyommatus</i>	<i>dorylas</i>	Turquoise Blue	NT	NT
LYCAENIDAE	<i>Polyommatus</i>	<i>eros</i>	Eros Blue	NT	NT
LYCAENIDAE	<i>Polyommatus</i>	<i>nephohtamenos</i>	Higgins's Anomalous Blue	NT*	NT*
LYCAENIDAE	<i>Polyommatus</i>	<i>nivescens</i>	Mother-of-pearl Blue	NT*	NT*
LYCAENIDAE	<i>Pseudophilotes</i>	<i>panoptes</i>	Panoptes Blue	NT*	NT*
LYCAENIDAE	<i>Pseudophilotes</i>	<i>vicrama</i>	Eastern Baton Blue	NT	NT
NYMPHALIDAE	<i>Boloria</i>	<i>chariclea</i>	Arctic Fritillary	NT	NT
NYMPHALIDAE	<i>Chazara</i>	<i>briseis</i>	The Hermit	NT	NT
NYMPHALIDAE	<i>Erebia</i>	<i>claudina</i>	White Speck Ringlet	NT*	NT*
NYMPHALIDAE	<i>Erebia</i>	<i>epistygne</i>	Spring Ringlet	NT*	NT*
NYMPHALIDAE	<i>Erebia</i>	<i>flavofasciata</i>	Yellow-banded Ringlet	NT*	NT
NYMPHALIDAE	<i>Euphydryas</i>	<i>desfontainii</i>	Spanish Fritillary	NT	NT
NYMPHALIDAE	<i>Euphydryas</i>	<i>iduna</i>	Lapland Fritillary	NT	NT
NYMPHALIDAE	<i>Hipparchia</i>	<i>fagi</i>	Woodland Grayling	NT*	NT
NYMPHALIDAE	<i>Hipparchia</i>	<i>hermione</i>	Rock Grayling	NT	NT
NYMPHALIDAE	<i>Hipparchia</i>	<i>leighebi</i>	Eolian Grayling	NT*	NT*
NYMPHALIDAE	<i>Hipparchia</i>	<i>sbordonii</i>	Ponza Grayling	NT*	NT*
NYMPHALIDAE	<i>Hipparchia</i>	<i>statilinus</i>	Tree Grayling	NT	NT
NYMPHALIDAE	<i>Maniola</i>	<i>halicarnassus</i>	Thomson's Meadow Brown	NT	NT
NYMPHALIDAE	<i>Melitaea</i>	<i>britomartis</i>	Assmann's Fritillary	NT	NT
NYMPHALIDAE	<i>Oeneis</i>	<i>norna</i>	Norse Grayling	NT	NT
PAPILIONIDAE	<i>Parnassius</i>	<i>apollo</i>	Apollo	NT	NT
PAPILIONIDAE	<i>Parnassius</i>	<i>phoebus</i>	Small Apollo	NT	NT
PAPILIONIDAE	<i>Zerynthia</i>	<i>cerisy</i>	Eastern Festoon	NT	NT
PIERIDAE	<i>Colias</i>	<i>hecla</i>	Northern Clouded Yellow	NT	NT
PIERIDAE	<i>Colias</i>	<i>phicomone</i>	Mountain Clouded Yellow	NT*	NT
PIERIDAE	<i>Zegris</i>	<i>eupheme</i>	Sooty Orange-tip	NT	NT
HESPERIIDAE	<i>Carcharodus</i>	<i>flocciferus</i>	Tufted Marbled Skipper	NT	LC
LYCAENIDAE	<i>Aricia</i>	<i>anteros</i>	Blue Argus	NT	LC
LYCAENIDAE	<i>Cupido</i>	<i>decoloratus</i>	Eastern Short-tailed Blue	NT	LC
LYCAENIDAE	<i>Plebejus</i>	<i>trappi</i>	Alpine Zephyr Blue	NT*	LC
NYMPHALIDAE	<i>Boloria</i>	<i>titania</i>	Titania's Fritillary	NT	LC
NYMPHALIDAE	<i>Melitaea</i>	<i>aurelia</i>	Nickerl's Fritillary	NT	LC
PAPILIONIDAE	<i>Archon</i>	<i>apollinus</i>	False Apollo	NT	LC
PAPILIONIDAE	<i>Parnassius</i>	<i>mnemosyne</i>	Clouded Apollo	NT	LC
LYCAENIDAE	<i>Plebejus</i>	<i>pylaon</i>	Eastern Zephyr Blue	NT	NE
NYMPHALIDAE	<i>Nymphalis</i>	<i>vaualbum</i>	False Comma	LC	VU
HESPERIIDAE	<i>Pyrgus</i>	<i>serratulae</i>	Olive Skipper	LC	NT
LYCAENIDAE	<i>Lycaena</i>	<i>alciphron</i>	Purple-shot Copper	LC	NT
LYCAENIDAE	<i>Lycaena</i>	<i>hippotoe</i>	Purple-edged Copper	LC	NT
LYCAENIDAE	<i>Phengaris</i>	<i>alcon</i>	Alcon Blue	LC	NT
LYCAENIDAE	<i>Polyommatus</i>	<i>ripartii</i>	Ripart's Anomalous Blue	LC	NT
LYCAENIDAE	<i>Scolitantides</i>	<i>orion</i>	Chequered Blue	LC	NT
NYMPHALIDAE	<i>Argynnis</i>	<i>laodice</i>	Pallas's Fritillary	LC	NT
NYMPHALIDAE	<i>Argynnis</i>	<i>niobe</i>	Niobe Fritillary	LC	NT
NYMPHALIDAE	<i>Limenitis</i>	<i>populi</i>	Poplar Admiral	LC	NT
NYMPHALIDAE	<i>Melitaea</i>	<i>diamina</i>	False Heath Fritillary	LC	NT
NYMPHALIDAE	<i>Melitaea</i>	<i>trivia</i>	Lesser Spotted Fritillary	LC	NT
NYMPHALIDAE	<i>Nymphalis</i>	<i>xanthomelas</i>	Yellow-legged Tortoiseshell	LC	NT

Forty-eight species were considered as Not Applicable, either due to their marginal occurrence in Europe or because they were introduced after AD 1500.

It should be noted that the figures for butterflies represent minimum estimates as objective data on trends over the last ten year period (as required by the IUCN criteria) are not available in many countries, including several eastern European countries which comprise a large part of the study region. Where no accurate trend data were available, compilers usually reported trends as stable, but this probably underestimated the true rate of loss at European scale. In countries with good trend data, a considerably greater proportion of butterflies are declining and threatened. Better population trend data are available through butterfly monitoring schemes that have been established in 14 countries, but funding is not yet available to collate and analyse these at a European level. It is likely that such an analysis would add several more species to the threat list and should be done as a matter of urgency.

Another problem is that for many western European countries, major declines of butterflies occurred in the 1950s-70s, and loss rates have slowed as species have been reduced to very low levels, often just below the IUCN thresholds for red listing. Many more species are therefore important conservation priorities as they are still declining, but not at a sufficient rate to be classified as threatened. The species classified both as threatened and Near Threatened (19% of total) are thus all high conservation priorities.

In comparison to butterflies, 11% of saproxylic beetles, 13% of birds, 14% of mammals, 15% dragonflies 19% of reptiles and 23% of amphibians are threatened at the European level (Nieto & Alexander 2010, BirdLife International 2004a, Temple & Terry 2007, Kalkman *et al.* 2010, Cox & Temple 2009, Temple & Cox 2009). No other groups have yet been comprehensively assessed at the European and EU27 level according to IUCN regional Red List guidelines.

The Violet Copper *Lycaena belle* (Endangered) is a rare and threatened butterfly in Europe. In the EU-27 countries most of the decline already happened before 1995. The few remaining populations were more or less stable in the last ten years. For this reason this species is considered only Least Concern in the EU-27 countries. It is mostly found on cool and wet meadows. Photograph © Chris van Swaay

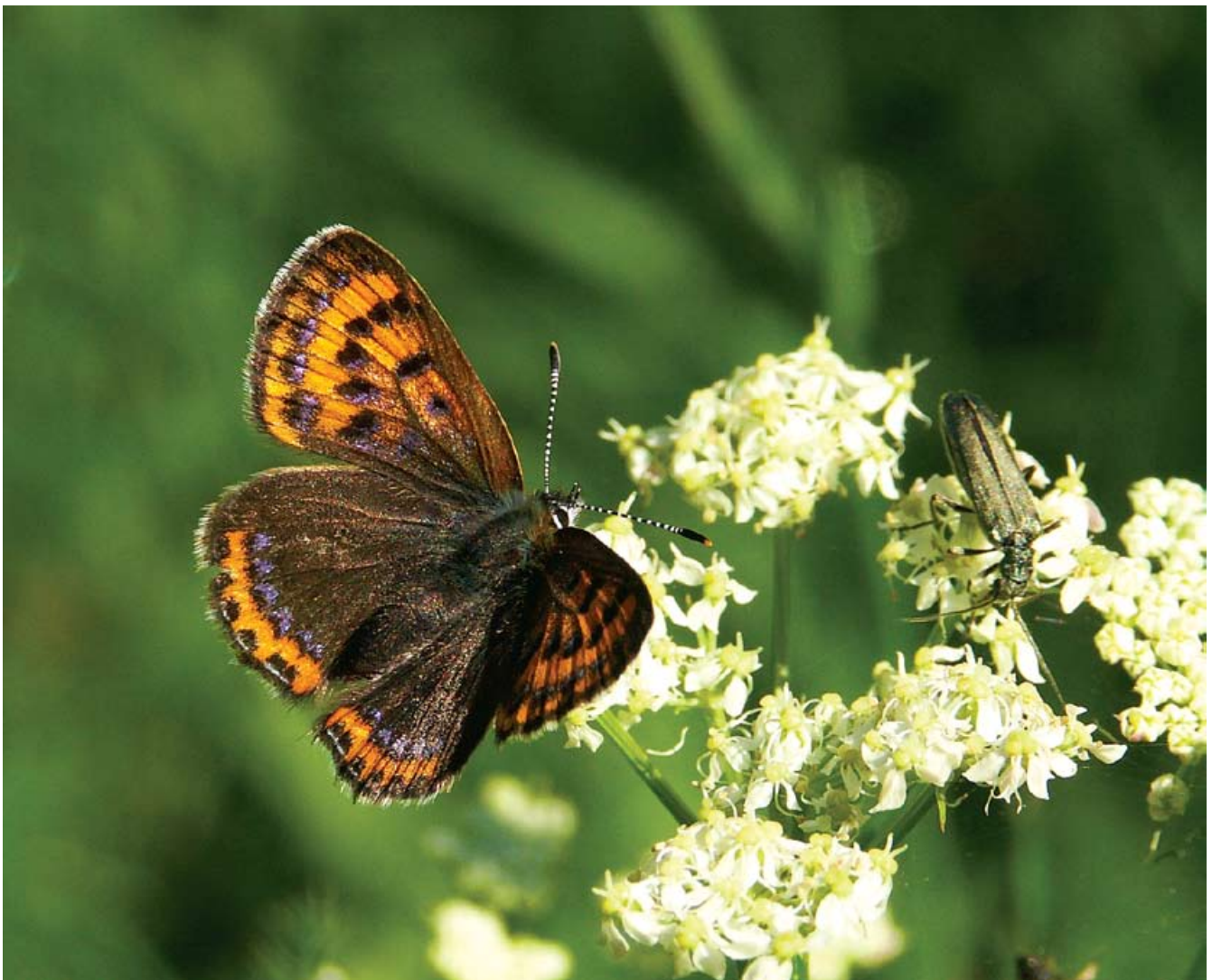


Table 5. Red List status (at the European level) of butterfly by taxonomic family

Family	Total*	RE	CR	EN	VU	NT	LC	DD	% Threatened*
HESPERIIDAE	43	0	0	0	1	4	38	0	2.3%
LYCAENIDAE	112	1	0	5	6	14	83	3	9.7%
NYMPHALIDAE	214	0	2	4	12	17	178	1	8.5%
PAPILIONIDAE	12	0	0	0	0	5	7	0	0.0%
PIERIDAE	53	0	1	3	3	4	42	0	13.2%
RIODINIDAE	1	0	0	0	0	0	1	0	0.0%
Total	435	1	3	12	22	44	349	4	8.5%

*Does not include species classed as Not Applicable (NA).

Three species are considered threatened at the European level, but Least Concern at the EU27 (*Lycaena helle*, *Coenonympha oedippus* and *Euphydryas maturna*). As a matter of fact, the decline of their populations in western Europe occurred in the last century and loss rates have slowed as species have been reduced to very low levels, often just below the IUCN thresholds for red listing, whereas in the eastern Europe, there is currently a steep decline observed for these species.

A high proportion of threatened and Near Threatened butterfly species are endemic to either Europe or EU, highlighting the responsibility that European countries have to protect the entire global populations of these species. This is particularly true for France, Italy, Spain, Greece and Bulgaria.

3.2 Status by taxonomic groups

The European butterflies belong to a number of different families (see Section 1.2), among which considerable differences exist both in species numbers as well as in threatened status (Table 5).

3.3 Spatial distribution of species

Information on the species richness of butterflies within families has already been given in Section 1.2 and Table 1. The geographic distribution of species richness in Europe is presented in Figure 5.

The top five EU countries in terms of butterflies species richness (in descending order) are: Italy, France, Spain, Greece and Bulgaria (Table 6).

3.3.1 Species richness

Figure 5 highlights areas of particular high concentrations of butterfly species. The greatest richness clearly coincides

Table 6. Number of butterfly species in the 27 current EU Member States (excluding introduced species).

Country	Total number of species
Austria	197
Belgium	88
Bulgaria	211
Cyprus	48
Czech Republic	140
Denmark	63
Estonia	98
Finland	110
France	244
Germany	178
Greece	230
Hungary	152
Ireland	30
Italy	264
Latvia	105
Lithuania	114
Luxembourg	78
Malta	18
Netherlands	55
Poland	147
Portugal	147
Romania	180
Slovakia	164
Slovenia	172
Spain	243
Sweden	108
United Kingdom	55

Figure 5. Species richness of European butterflies

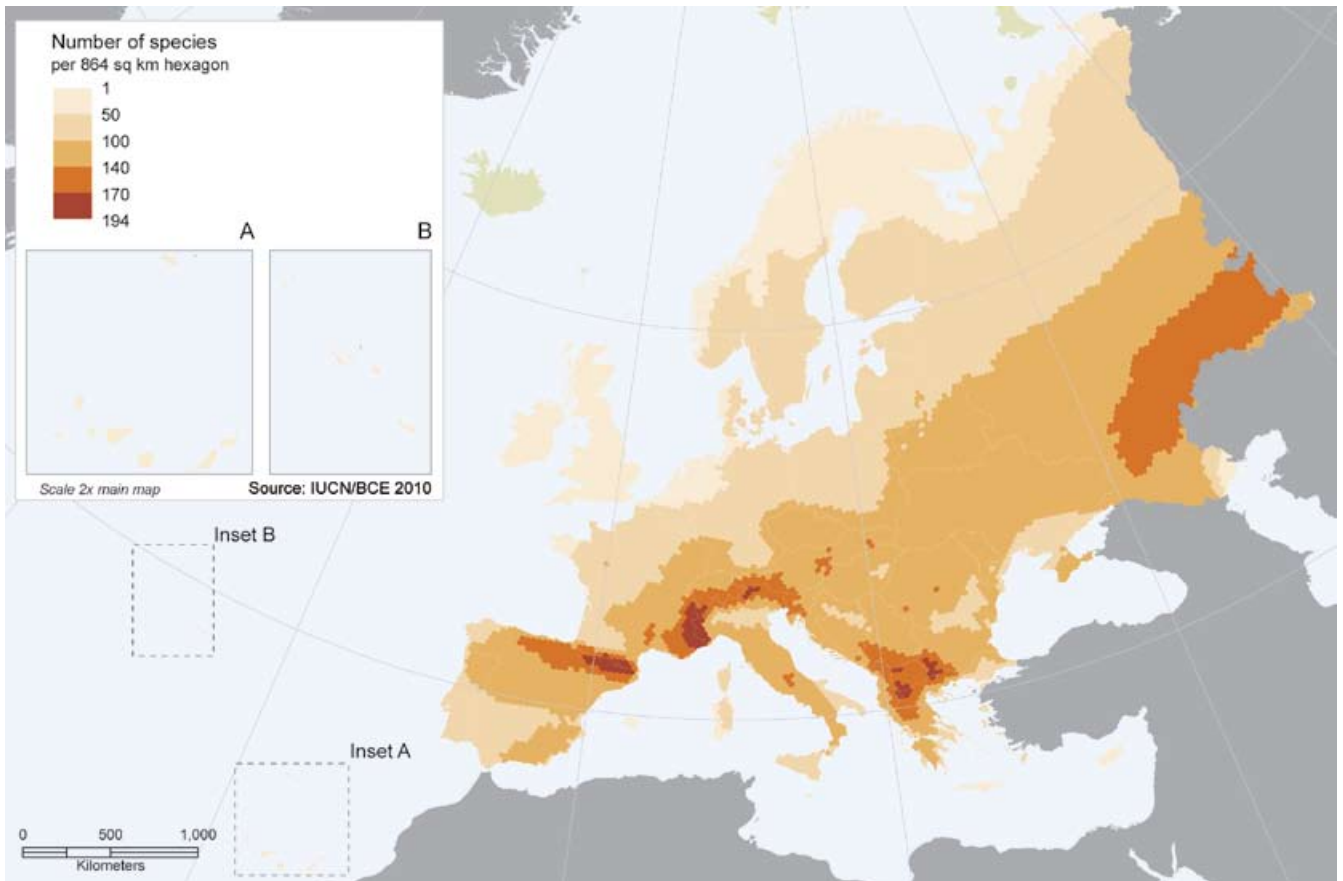
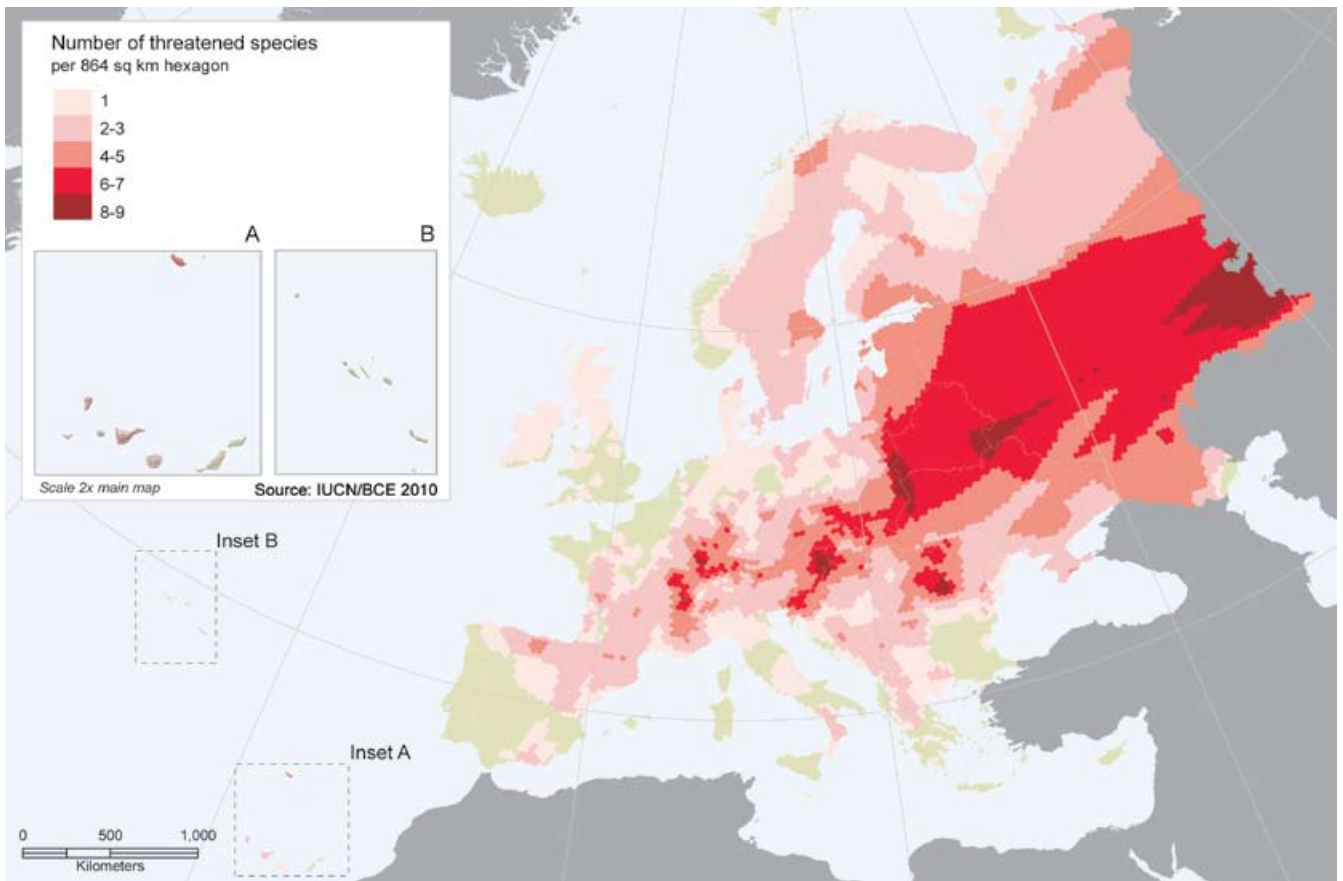


Figure 6. Distribution of threatened butterflies in Europe



with mountainous areas in the south of Europe: the Cantabrian Mountains, the Pyrenees, the Alps, the Apennines, the Dinaric Alps, the Carpathians and the mountains of the Balkans, which host numerous species of very restricted range. Southern Russia also seems to host a high number of species.

3.3.2 Distribution of threatened species

The distribution of threatened butterflies in Europe (Figure 6) shows different patterns from the picture of the overall species diversity. Some of the threatened species still occur widely in Russia, for example *Coenonympha hero*, *C. tullia*, *Colias myrmidone*, *Euphydryas maturna*, *Lopinga achine*, *Lycaena helle*, *Phengaris arion* and *P. teleius*. In central Europe, most threatened species can be found in eastern France, eastern Austria, the Romanian Carpathians and eastern Poland.

Figure 6 shows that the greatest concentrations of threatened butterfly species are found in central and eastern Europe. The reasons for this pattern are likely to be complex and to involve a combination of a wide

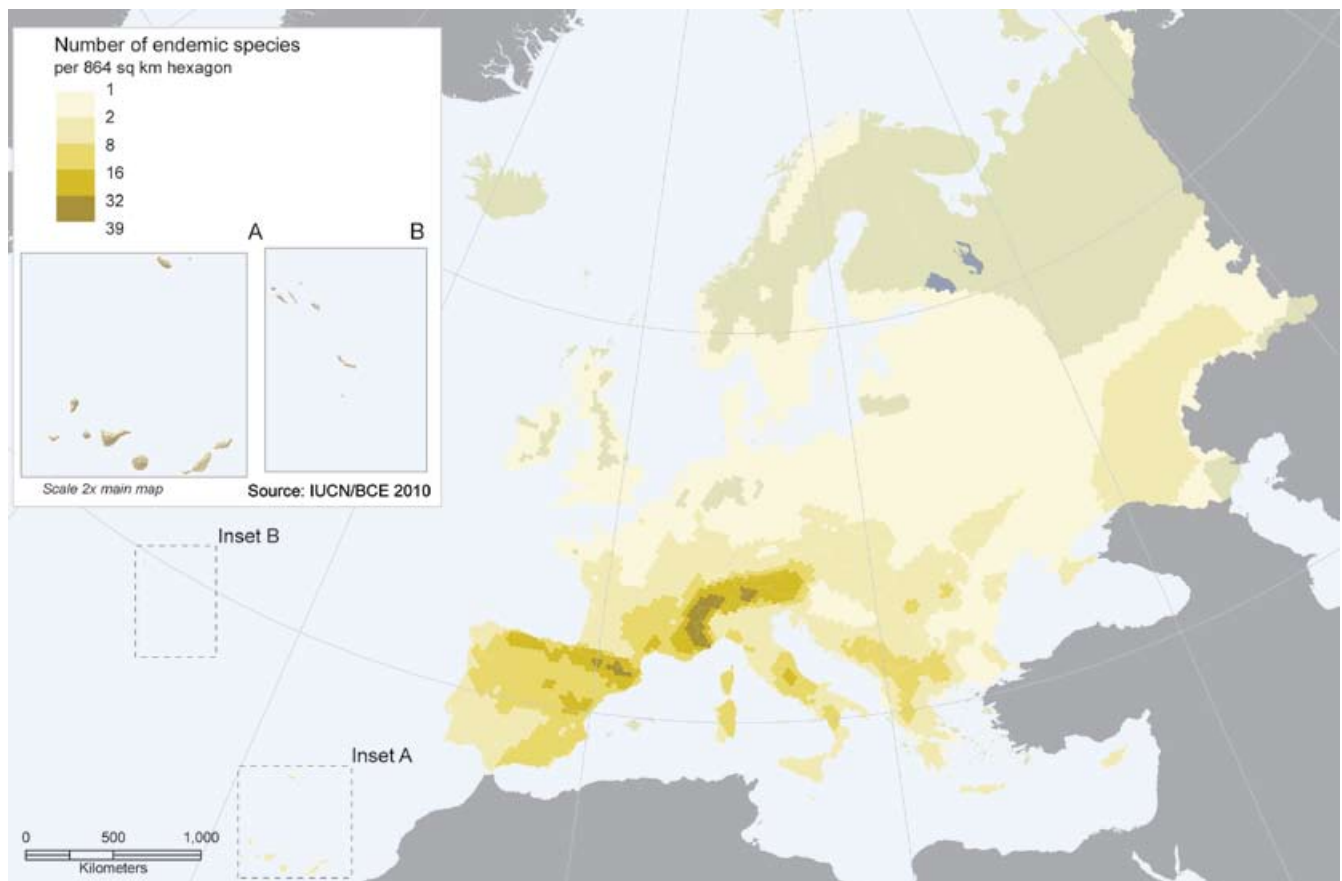
range of factors. One factor is that these regions hold concentrations of habitats used by threatened species, notably mountain grasslands and wet meadows. Another is that they coincide to some extent with general butterfly diversity and regions where eastern and western faunas overlap. Another factor is that species in western Europe that have suffered major historical declines and loss rates have now slowed to just below IUCN thresholds, whereas species in eastern Europe appear to be suffering from a more recent loss of habitat and hence decline in populations.

3.3.3 Endemic species richness

Figure 7 shows the distribution of endemic butterfly species (e.g. those that are unique to Europe and are found nowhere else in the world).

Particularly high numbers of endemic species are found in the Alps and the Pyrenees. Other important concentrations of endemics are found in mountainous areas in Spain (e.g. Sierra Nevada and Cantabrian Mountains) and in Italy (the Apennines), as well as in the Balkans.

Figure 7. Distribution of endemic butterfly species in Europe



The Sudeten Ringlet *Erebia sudetica* is a European endemic found on alpine and sub-alpine grasslands, especially those near the tree-line. Its population has declined by more than 30% in the last 10 years, therefore it is considered as Vulnerable Photograph © Neil Thompson



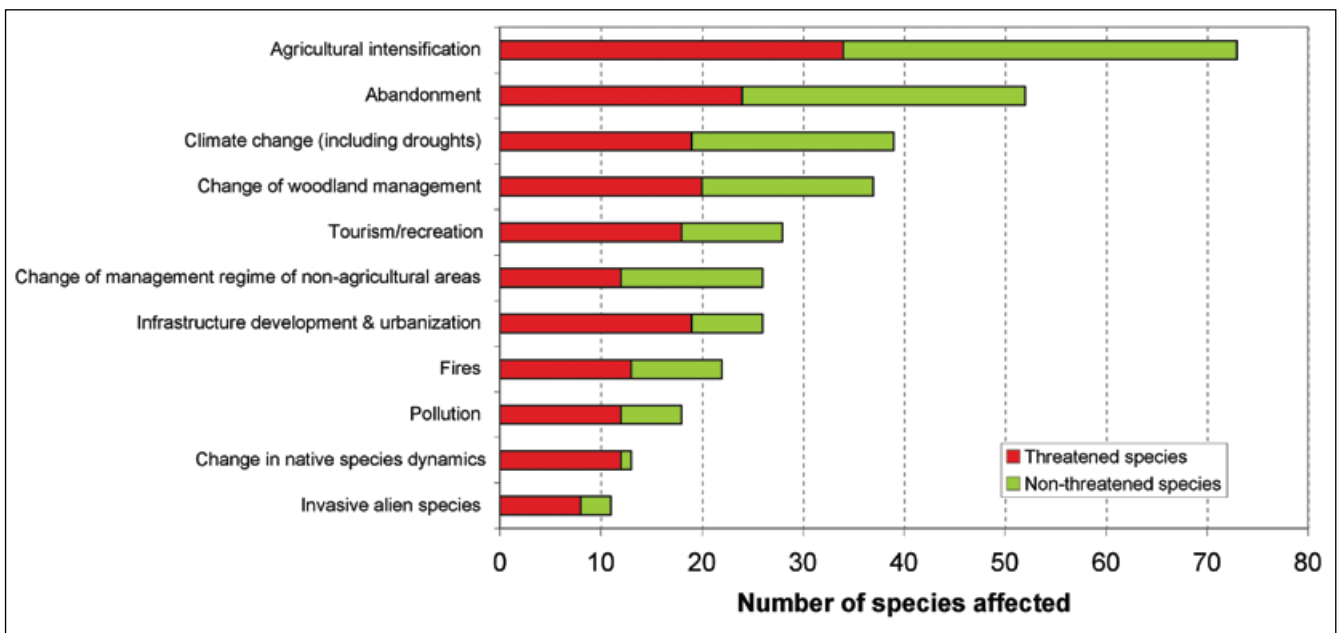
3.4 Major threats to butterflies in Europe

The major threats to each species were coded using the IUCN Threats Classification Scheme. A summary of the relative importance of the different threatening processes is shown in Figure 8.

Butterflies have very specific food and habitat requirements at different stages of their life cycle. They are therefore particularly sensitive to modifications of their environment and serve as an excellent indicator of the status of the ecosystems. They are especially sensitive to changes in habitat management such as overgrazing, undergrazing or changes in forestry practice. More than half of the butterfly species inhabit grasslands, woodland and scrub are home to about a quarter of the species, while the rest are found in other types of ecosystems (rocky slopes, etc.).

The major drivers of butterfly habitat loss and degradation are related to agricultural intensification, for example through conversion of grasslands to crop fields, the improvement of flower-rich grasslands, drainage of wetlands, and the intensification of livestock grazing. While agricultural intensification tends to take place on more productive land, the decline of traditional patterns of agriculture on more marginal areas leads to abandonment of land and to the subsequent invasion of shrubs and trees (especially in eastern Europe and in

Figure 8. Major threats to butterflies in Europe



the Mediterranean). This trend is affecting a wide range of wildlife groups (Poole *et al.* 1998, Tucker & Heath 1994) and is considered to be the second major threat to European butterflies, affecting species such as *Phengaris arion*, *Lycaena helle* and *Colias myrmidone*.

Climate change is already impacting some populations (in particular of tundra species like *Colias hecla* and *Euphydryas iduna*) and is likely to affect additional species more significantly in the future (Settele *et al.* 2008). Climate is a major factor determining the distribution of species (biogeography), as well as the distribution of the vegetation. Climate change may simply shift these distributions but, for a number of reasons, plants and animals may not be able to keep track of these changes. The pace of climate change will almost certainly be more rapid than most plants are able to migrate. The presence of roads, cities, and other barriers associated with human presence may provide no opportunity for distributional shifts. For this reason, there is likely to be a serious mismatch between the future climatic zones that are suitable for butterflies and their main foodplants (Schweiger *et al.* 2008).

Within woodlands, many butterfly species rely on open areas, clearings, grass patches or woodland margins and require regular forest management (Van Swaay & Warren 1999). A major factor in the decline of such species is the widespread changes in woodland management across Europe, leading to reduced habitat suitability. This is a serious threat to declining species such as *Lopinga achine* and *Hamearis lucina*.

Changes in the management of non-agricultural areas, such as grasslands, are also an important threat. In some cases, land-use changes, even under EU funded agri-environment schemes, and unfavourable grassland management (wrong timing or intensity) have led to drastic declines (see Konvicka *et al.* 2008). However, where agri-environment schemes have been well designed and implemented, they have led to some positive results for butterflies (e.g. Brereton *et al.*, 2008)

On islands (such as the Canary Islands or Madeira), as well as in the Mediterranean, the increased frequency and intensity of fires, the development of tourism activities and urbanisation destroy important breeding habitat, such as the laurel forest.

A serious factor in the decline of many species is the extreme fragmentation of their habitats following decades of habitat loss and/or unsuitable management.

The remaining meadows, forests, or other habitats now often occur in small, isolated patches rather than in large, intact units. They act like little islands, where only small populations can survive. Such small, isolated populations are more prone to extinction from normal population fluctuations and from extreme events such as fire or drought. Natural re-colonisation is less likely in such isolated sites and regional extinction more likely (Hanski 1999). As habitat loss is still continuing, fragmentation is a growing threat to European butterflies.

Pesticides and herbicides kill both adult butterflies and caterpillars, some of them being targeted as “pest” because their caterpillars feed on farm crops, but other inoffensive species suffer the same fate. Furthermore, domestic and agricultural pollution (such as nitrogen deposition) leads to a faster succession of vegetation, thus reducing the area of suitable habitat and habitat connectivity substantially.

Invasive species are also a problem to some species, especially on islands: the introduction of alien parasites might be the cause of decline of the Canary Islands Large White (*Pieris cheiranthi*) (Lozan *et al.* 2007), and the introduction of other butterfly species might threaten native species, as is probably the case on Madeira, where the Speckled Wood (*Pararge aegeria*), a widespread species in Europe, colonized the island in the 1970s and is now possibly threatening the Madeiran Speckled Wood (*Pararge xiphia*) (Jones & Luce 2008).

The Large Copper *Lycaena dispar* (Least Concern) occurs in a range of grassland types, where it breeds on docks and sorrels. It is protected under the EU Habitats and Species Directive. Although it has declined in many countries, it is expanding its range in some central and eastern countries and is classified as Least Concern. Photograph © Chris van Swaay



3.5 Demographic trends

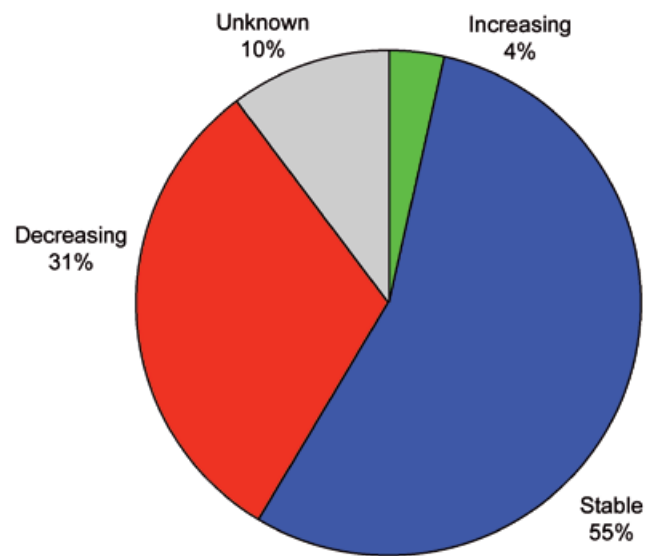
Documenting population trends is key to assessing species status, and a special effort was made to determine which species are believed to be significantly declining, stable, or increasing. About a third (31%) of the European butterflies are considered to be declining. More than half (55%) of them seem to have stable populations, while only 4% are increasing (Figure 9). A further 10% have unknown population trends. As explained above in section 3.1, these are likely to be considerable underestimates of the number of species declining due to lack of good objective trend data in many countries.

By contrast, 14% of saproxylic beetles (Nieto and Alexander 2010), 26% of dragonflies (Kalkman *et al.* 2010), 27% of mammal species, 42% of reptile species (Cox and Temple 2009) and 59% of amphibian species (Temple and Cox 2009) have declining populations, acknowledging that the proportion of mammal species with unknown population trend is quite high (33%) (Temple and Terry 2007, 2009). Just under a quarter (23%) of European birds is decreasing in number, based on population trends between 1990 and 2000 (BirdLife International 2004a).

BirdLife International's analysis of population trends in European birds was based on quantitative data from a well established monitoring network covering the majority of

species and countries in Europe. For butterflies there is also a network of Butterfly Monitoring Schemes covering 14 countries at present. For 17 grassland butterfly species European trends have been established (Van Swaay and Van Strien, 2008). There are at least a few dozen other species for which such European trends could be established immediately from the data already gathered. A better use of the monitoring data of butterfly populations in Europe and an extension to under-recorded areas is urgently needed, especially for threatened, Near Threatened and Data Deficient species.

Figure 9. Population trends of European butterflies



The Apollo *Parnassius apollo* is a striking butterfly associated with mountain screes where its caterpillars feed on Sedums. Its overall European population declined by almost 30% in the last 10 years, leading to it being classified as Near Threatened. However, its colonies at many lowland sites, many of which are genetically unique, have declined far more severely and it has become extinct in several mountain ranges over the last 100 years. Photograph © Bosse van Swaay



4. Conservation measures

4.1 Protection of habitats and species in Europe

European countries and EU Member States are signatories to a number of important conventions aimed at conserving biodiversity that are particularly relevant to butterflies, including the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats, and most importantly, the 1992 Convention on Biological Diversity. Many European countries and other administrative units (states, provinces, etc.) also afford butterflies some form of protective species legislation.

The Bern Convention is a binding international legal instrument that aims to conserve wild flora and fauna and their natural habitats and to promote European co-operation towards that objective. It covers all European countries and some African states. In particular 22 species listed on Appendix II (strictly protected species) of the Bern Convention are included in this Red List. (Four species of moths are also included in Annex II and 1 species of moth is included in Annex III) (see Table 7).

European countries and the EU have made the commitment to reduce (or halt) the loss of biodiversity within Europe by 2010. This means that not only should extinctions be prevented, but population declines should also be reversed. The present study has shown that a large number of butterfly species show continuing declines and many are under serious threat. Given this result it seems highly unlikely that the 2010 target of halting biodiversity loss will be met for this indicator group of insects.

4.2 Protection of habitats and species in the EU27

EU nature conservation policy is based on two main pieces of legislation - the Birds Directive² and the Habitats Directive³. The main aim of this nature conservation policy is to ensure the favourable conservation status (see Box 1) of the habitats and species found in the EU. One of the main tools to enhance and maintain this status is the Natura 2000 network of protected areas.

EU nature conservation policy also foresees the integration of its protection requirements into other EU sectoral policies such as agriculture, regional development and transport. The Habitats Directive, which aims to protect other wildlife species and habitats, applies to both terrestrial and marine regions. Each Member State is required to identify sites of European importance and is encouraged to put in place a special management plan to protect them, combining long-term conservation with economic and social activities as part of a sustainable development strategy. These sites, together with those of the Birds Directive, make up the Natura 2000 network - the cornerstone of EU nature conservation policy. The Natura 2000 network has grown over the last 25 years and now includes more than 26,000 protected areas in all Member States combined, with a total area of around 850,000 km² – more than 20% of total EU territory⁴.

The Habitats Directive contains a series of Annexes that mostly identify 'habitats' and species of European Community concern. Member States are required to designate Natura 2000 sites for the species listed on Annex II; Annex IV species are subject to a strict protection system. Table 7 shows those species identified as threatened by the assessment and their inclusion in the protected species Annexes of the Habitats Directive and Appendix II and III of the Bern Convention.

In particular there are 31 butterfly species listed on the Annex II and IV of the Habitats Directive, of which 12 are now classed as threatened in Europe, and 5 are classed as Near Threatened as a result of this project. This means that the majority of the species listed in the Annexes are in need of greater conservation action. However this assessment has also revealed that 39 European butterfly species are threatened either at the European or EU27 level, of which only 12 are legally protected in Europe. Most of the Habitats Directive species listed that are not included in the current Red List are still declining in parts of their range, or have suffered historical declines and are still in need of conservation effort. Many are also valuable indicators of important habitats and their conservation will bring wide biodiversity benefits.

2 Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds.

3 Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna.

4 Source: http://ec.europa.eu/environment/nature/index_en.htm, downloaded November 2009.

Table 7. The threatened butterfly taxa identified by the assessment and their presence on either Annexes II and IV of the Habitats Directive or Appendices II or III of the Bern Convention. An asterisk (*) indicates that the species is a priority species for the Habitats Directive.

Genus	Species	Red List status		Habitats Directive	Bern Convention
		Europe	EU27	Annexes	Annexes
<i>Aricia</i>	<i>hyacinthus</i>	RE	RE		
<i>Pieris</i>	<i>wollastoni</i>	CR	CR		
<i>Coenonympha</i>	<i>phryne</i>	CR	NE		
<i>Pseudochazara</i>	<i>cingovskii</i>	CR	NE		
<i>Colias</i>	<i>myrmidone</i>	EN	CR	II/IV	
<i>Phengaris</i>	<i>arion</i> ¹	EN	EN	II/IV	II
<i>Plebejus</i>	<i>zulichi</i>	EN	EN		
<i>Polyommatus</i>	<i>humedasaе</i>	EN	EN		II
<i>Turanana</i>	<i>taygetica</i>	EN	EN		
<i>Boloria</i>	<i>improba</i>	EN	EN	II ²	
<i>Pararge</i>	<i>xiphia</i>	EN	EN		
<i>Gonepteryx</i>	<i>maderensis</i>	EN	EN		
<i>Pieris</i>	<i>cheiranthi</i>	EN	EN		
<i>Lycaena</i>	<i>helle</i>	EN	LC	II/IV	
<i>Coenonympha</i>	<i>oedippus</i>	EN	LC	II/IV	II
<i>Pseudochazara</i>	<i>euxina</i>	EN	NE		
<i>Tomares</i>	<i>nogelii</i>	VU	RE		
<i>Pyrgus</i>	<i>cirsii</i>	VU	VU		
<i>Phengaris</i>	<i>teleius</i> ³	VU	VU	II/IV	II
<i>Polyommatus</i>	<i>galloi</i>	VU	VU		II
<i>Polyommatus</i>	<i>golgus</i>	VU	VU	IV ⁴	II ⁴
<i>Polyommatus</i>	<i>orphicus</i>	VU	VU		
<i>Polyommatus</i>	<i>violetae</i>	VU	VU		
<i>Boloria</i>	<i>polaris</i>	VU	VU		
<i>Coenonympha</i>	<i>hero</i>	VU	VU	II/IV	II
<i>Erebia</i>	<i>christi</i>	VU	VU	II/IV	II
<i>Erebia</i>	<i>sudetica</i>	VU	VU	II/IV	II
<i>Hipparchia</i>	<i>bacchus</i>	VU	VU		
<i>Hipparchia</i>	<i>tilosi</i>	VU	VU		
<i>Lopinga</i>	<i>achine</i>	VU	VU	IV	II
<i>Pseudochazara</i>	<i>amymone</i>	VU	VU		
<i>Pseudochazara</i>	<i>orestes</i>	VU	VU		
<i>Colias</i>	<i>chrysotheme</i>	VU	VU		
<i>Euchloe</i>	<i>bazae</i>	VU	VU		
<i>Gonepteryx</i>	<i>cleobule</i>	VU	VU		
<i>Coenonympha</i>	<i>tullia</i>	VU	NT		
<i>Euphydryas</i>	<i>maturna</i>	VU	LC	II/IV ⁵	II ⁵
<i>Coenonympha</i>	<i>orientalis</i>	VU	DD		
<i>Leptidea</i>	<i>morsei</i>	NT	EN	II/IV	
<i>Nymphalis</i>	<i>vaualbum</i>	LC	VU	II*/IV	

1 as *Maculinea arion*

2 as *Clossiana improba*

3 as *Maculinea teleius*

4 as *Plebicula golgus*

5 as *Hypodryas maturna*

The Scarce Large Blue *Phengaris teleius* (Vulnerable) is a typical species of wet meadows with the Great Burnet (*Sanguisorba officinalis*). The small caterpillars only feed on the flowerheads for two or three weeks. They then go down to the ground where they wait to be picked up by worker ants of the genus *Myrmica* and carried off to the ants' nest. There they feed on ant grubs. The caterpillars also hibernate and pupate in the ants' nest. The species of host ant varies in different parts of its range. Because of this complicated lifecycle the butterfly is vulnerable to any changes in the environment that affect either the hostplants or hostants. In large parts of Europe this species declines because of either intensification (e.g. drainage, fertilization, use of pesticides) or abandonment (where its habitat gets invaded by scrubs and later forest). It is listed on both the Annexes II and IV of the Habitat Directive and in the Annexe II of the Bern Convention. Photograph © Chris van Swaay



4.3 Conservation management of butterflies in the EU

LIFE is the EU's financial instrument supporting environmental and nature conservation projects throughout the EU as well as in some candidate, acceding and neighbouring countries. Since 1992, LIFE has co-financed over 3,104 projects with a total budget of approximately €2.2 billion. LIFE supports the implementation of the Birds and Habitats Directives and the establishment of the Natura 2000 network. Projects involve a variety of actions including habitat restoration, site purchases, communication and awareness-raising, protected area infrastructure and conservation planning.

Based on a search of the LIFE project database that lists all past and current LIFE projects, 46 projects link their actions to butterflies conservation and target 13 specific species. Table 8 shows the taxonomic breakdown of these projects. Examples of actions taken within these projects include habitat restoration, habitat conservation and action for sustaining butterflies populations. However, projects aimed at restoring natural habitat and targeting other insect species might be beneficial to butterflies as well.

Table 8. The number of LIFE projects targeted either towards specific species or habitats for butterflies. This review is based on a search for butterfly species on the LIFE database <http://ec.europa.eu/environment/life/project/Projects/index.cfm>. Some projects target more than one species. Most of the 53 projects were focused at the habitat or site level rather than on particular species.

Genus	Species	LIFE projects
<i>Coenonympha</i>	<i>oedippus</i>	2
<i>Colias</i>	<i>myrmidone</i>	1
<i>Erebia</i>	<i>polaris</i> ¹	2
<i>Euphydryas</i>	<i>aurinia</i>	16
<i>Euphydryas</i>	<i>maturna</i> ²	1
<i>Lopinga</i>	<i>achine</i>	2
<i>Lycaena</i>	<i>dispar</i>	8
<i>Lycaena</i>	<i>helle</i>	3
<i>Phengaris</i>	<i>arion</i> ³	1
<i>Phengaris</i>	<i>nausithous</i> ⁴	3
<i>Phengaris</i>	<i>teleius</i> ⁵	5
<i>Parnassius</i>	<i>mnemosyne</i>	1
<i>Zerynthia</i>	<i>polyxena</i>	1

1 as *Erebia medusa polaris*

2 as *Hypodryas maturna*

3 as *Maculinea arion*

4 as *Maculinea nausithous*

5 as *Maculinea teleius*

4.4 Extinction risk versus conservation status

The IUCN Red List Criteria classify species solely on the basis of their relative extinction risk (IUCN 2001). However, Unfavourable Conservation Status according to the EU Habitats Directive has a much broader definition. This is identified clearly in Article 1 of the Directive (see Box 1). No species meeting the IUCN Red List Criteria for one of the threatened categories at a regional level can be considered to have a Favourable conservation status in the EU. To be classified as Vulnerable (the lowest of the three IUCN threatened categories) a species must undergo a reduction in population size of at least 30% over ten years or three generations (or have a very small or small and declining population or geographic range; see the 2001 IUCN Red List Categories and Criteria version 3.1 <http://www.iucnredlist.org/technical-documents/categories-and-criteria>). It is difficult to claim that a species experiencing a decline of this magnitude is maintaining its population, that its range is stable, and that it remains a viable component of its habitat. Crucially, however, this does not mean that the opposite is true: species that

are not threatened as defined by IUCN Red List Criteria do not necessarily have a Favourable Conservation Status (BirdLife International 2004a). Guidelines issued by the European Commission on the protection of animal species under the Habitats Directive reinforce this message that ‘the fact that a habitat or species is not threatened (i.e. not faced by any direct extinction risk) does not necessarily mean that it has a favourable conservation status’ (Anon. 2007).

Many butterfly species remain widely distributed in Europe, although their populations and ranges have suffered significant long-term decline as a result of habitat loss and degradation in conjunction with other threats (see Sections 3.4 and 3.5). The European Red List has highlighted the fact that about a third of butterflies have declining populations and 10% have an unknown population trend (see Figure 9). It should however be noted that both the distribution and population size of numerous species have declined severely during the 20th century (but not in the timeframe of 10 years taken into consideration by IUCN methodology) or at a rate that does not exceed 30%, and thus does not satisfy IUCN Red List Criteria. Therefore, although many of these species would be categorised as Near Threatened or Least Concern, they could not be regarded as having Favourable Conservation Status.

Box 1. Selected provisions of the EU Habitats Directive (92/43/EEC)

Article 1(i) defines the conservation status of a species as “the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations in the European territory of the Member States”. It states that a species’ conservation status will be taken as Favourable when:

- Population dynamics data on the species concerned suggests that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the considerable future; and
- There is, and probably will continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

4.5 Red List versus priority for conservation action

Assessment of extinction risk and setting conservation priorities are two related but different processes. Assessment of extinction risk, such as the assignment of IUCN Red List Categories, generally precedes the setting of conservation priorities. The purpose of the Red List categorization is to produce a relative estimate of the likelihood of extinction of a taxon. Setting conservation priorities, on the other hand, normally includes the assessment of extinction risk, but also takes into account other factors such as ecological, phylogenetic, historical, economical, or cultural preferences for some taxa over others, as well as the probability of success of conservation actions, availability of funds or personnel, cost-effectiveness, and legal frameworks for conservation of threatened taxa. In the context of regional risk assessments, a number of additional pieces of information are valuable for setting conservation priorities. For example, it is important to consider not only conditions within the region but also the status of the taxon from a global perspective and the proportion of the global population that occurs within the region. A decision on how these three variables, as well as other factors, are used for establishing conservation priorities is a matter for the regional authorities to determine.

The Nogel’s Hairstreak *Tomares nogelii* (Vulnerable) is a habitat specialist that feeds solely on *Astragalus ponticus*. It has a highly fragmented distribution, which is little known. Tourist activities and agricultural improvement have diminished many colonies and the remaining populations are mainly threatened by changes in agricultural practices. It has disappeared from the EU-27 countries, but can still be found in Ukraine. Photograph © Albert Vliegenthart



5. Conclusion and recommendations

1.1 Overview and recommendations for conservation measures

Overall, about 9% of European butterflies are threatened in Europe, and 7% are threatened at the EU27 level. A further 10% of butterflies are considered Near Threatened. Thus, almost one-fifth of butterflies in Europe are Threatened or Near Threatened. About a third (31%) of the European butterflies has declining populations, even though not always at a rate that would meet the IUCN Red List Criteria (i.e. a population decline of 30% in the last 10 years). It should be noted that both the distribution and population size of numerous species have declined severely during the 20th century (but not in the timeframe of 10 years or three generations taken into consideration by IUCN methodology), especially in Western Europe. In some cases the few remaining populations in these countries are nowadays stable as a result of conservation measures, which means these species do not occur in the list of threatened species.

The highest diversity of butterflies is found in the mountainous areas of the southern Europe, whereas most of the threatened species are confined to parts of central and eastern Europe. The main current threat to European butterflies is the loss of their habitat or habitat connectivity due to the changes in agricultural practices, either through intensification or abandonment. Other important threats are climate change, increased frequency and intensity of fires and tourism development.

In order to improve the conservation status of European butterflies and to reverse these negative trends, further conservation actions are urgently needed. In particular:

- Include European threatened species when revising relevant national and regional legislation.
- Draw up Species Action (Recovery) Plans to cover all threatened European species
- Improve the protection of butterfly habitats throughout Europe to include key individual sites and whole landscapes.
- Protect and manage the network of Prime Butterfly Areas that have been identified in Europe as a priority (van Swaay & Warren 2003). In the European Union these should be integrated into the Natura 2000 network.
- Ensure that all semi-natural habitats are managed appropriately for threatened butterflies and ensure

continuation of traditional management systems on which so many species depend.

- Establish a co-ordinated system of butterfly recording and monitoring in every European country to improve future priority assessments and assess the impact of conservation measures and future environmental change, including climate change.
- Revise the list of threatened European butterflies regularly and when new data become available (eg from collating data from the butterfly monitoring schemes running in 14 countries).
- Conduct further ecological research on threatened European species and the adequate management of their habitats to underpin conservation programmes.
- Develop measures to conserve entire landscapes in Europe and reduce impact of habitat fragmentation and isolation.
- Improve policy measures to conserve wildlife habitats in Europe, especially the Common Agricultural Policy.

The Scarce Fritillary *Euphydryas maturna* occurs in clearings, where young ash trees are growing in open, mixed woodland. In the EU-27 it showed a strong decline in the 20th century, but the few remaining populations showed only a small decline in the last ten years, not enough to make it a threatened species according to the Red List criteria. In the rest of Europe it continues to decline rapidly and even large populations are disappearing. Therefore it is considered Vulnerable in Europe as a whole. Photograph © Tom Nygaard Kristensen



5.2 Application of project outputs

This Butterfly Red List is part of a wider project aimed at comprehensively assessing several taxonomic groups (mammals, amphibians, reptiles, freshwater fish, dragonflies), and selected beetles, molluscs and plants. It has gathered large amounts of data on the population, ecology, habitats, threats and recommended conservation measures for each species assessed. These data are freely available on the IUCN Red List website (www.iucnredlist.org/europe), on the European Commission website (<http://ec.europa.eu/environment/nature/conservation/species/redlist>) and through paper publications (see the list of European Red List published at the end of this report).

In conjunction with the data on European birds published by BirdLife International (BirdLife International 2004a,b), it provides key resources for decision-makers, policy-makers, resources managers, environmental planners and NGOs. This Red List is a dynamic tool that will evolve with time, as species are reassessed according to new information or situations. It is aimed at stimulating and supporting research, monitoring and conservation action at local, regional and international levels, especially for threatened, Near Threatened and Data Deficient species.

The outputs of this project can be applied to inform policy, to identify priority sites and species to include in research and monitoring programmes and to identify internationally important areas for biodiversity. It also contributes to broaden the coverage of invertebrates on the global IUCN Red List, thanks to the assessment of endemic European butterflies.

5.3 Future work

Through the process of gathering and compiling butterfly data across Europe, several knowledge gaps have been identified. There are in particular significant geographical and taxonomical biases in the quality and quantity of data available on the distribution and status of species.

If the butterfly assessments are periodically updated, they will enable the changing status of these species to be tracked through time via the production of a Red List Index (Butchart *et al.* 2004, 2005, 2006, 2007). To date, this indicator has been produced for birds at the European regional level and has been adopted as one of the headline biodiversity indicators to monitor progress towards halting biodiversity loss in Europe by 2010 (European Environment Agency 2007). By regularly updating the data presented here we will be able to track the changing fate of European butterflies to 2010 and beyond.

The Piedmont Anomalous Blue (*Polyommatus humedasa*) occurs only on a few warm, dry, rocky slopes in one valley in Northern Italy alone. It is listed as Endangered both in Europe and in EU-27. Photo © Kars Veling



References

- BirdLife International. 2004a. *Birds in Europe: population estimates, trends, and conservation status*. BirdLife International, Cambridge, UK.
- BirdLife International. 2004b. *Birds in the European Union: a status assessment*. BirdLife International, Wageningen, The Netherlands.
- Brereton, T. M., Warren, M. S., Roy, D. B. & Stewart, K. (2008) The changing status of the Chalkhill Blue butterfly *Polyommatus coridon* in the UK: the impacts of conservation policies and environmental factors. *Journal of Insect Conservation* 12: 629-638.
- Butchart, S.H.M., Stattersfield, A.J., Bennun, L.A., Shutes, S.M., Akcakaya, H.R., *et al.* 2004. Measuring global trends in the status of biodiversity: Red List Indices for birds. *PLoS Biology* 2: e383.
- Butchart, S.H.M., Stattersfield, A.J., Baillie, J.E.M., Bennun, L.A., Stuart, S.N., *et al.* 2005. Using Red List Indices to measure progress towards the 2010 target and beyond. *Philosophical Transactions of the Royal Society of London B* 360: 255–268.
- Butchart, S.H.M., Akcakaya, H.R., Kennedy, E., Hilton-Taylor, C. 2006. Biodiversity indicators based on trends in conservation status: strengths of the IUCN Red List Index. *Conservation Biology* 20: 579–581.
- Butchart, S.H.M., Akcakaya, H.R., Chanson, J., Baillie, J.E.M., Collen, B., *et al.* 2007. Improvements to the Red List Index. *PLoS ONE* 2(1): e140. doi:10.1371/journal.pone.0000140.
- Central Intelligence Agency. 2009. The World Factbook. <https://www.cia.gov/library/publications/the-worldfactbook/>.
- Cox, N.A. and Temple, H.J. 2009. *European Red List of Reptiles*. Luxembourg: Office for Official Publications of the European Communities.
- Cuttelod, A., García, N., Abdul Malak, D., Temple, H. & Katariya, V. 2008. The Mediterranean: a biodiversity hotspot under threat. In: J.-C. Vié, C. Hilton-Taylor and S.N. Stuart (eds). *The 2008 Review of the IUCN Red List of Threatened Species*. IUCN Gland, Switzerland.
- Eitschberger, U. and Stamer P.1990. *Cacyreus marshalli* Butler, 1898, eine neue Tagfalterart für die europäische Fauna? (Lepidoptera, Lycaenidae). – *Atalanta* 21(1/2): 101–108.
- European Environment Agency. 2007. *Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe*. EEA Technical Report No. 11/2007.
- Fauna Europaea Web Service. 2004. Fauna Europaea version 1.1, Available online at <http://www.faunaeur.org>
- Gardiner, B. 2003. The possible cause of extinction of *Pieris brassicae wollastoni* Butler (Lepidoptera: Pieridae). *Entomologist's Gazette* 54:267–268.
- IUCN. 1994. *IUCN Red List Categories*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1*. IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN. 2003. *Guidelines for application of IUCN Red List Criteria at Regional Levels: Version 3.0*. IUCN Species Survival Commission. IUCN, Gland, Switzerland.
- IUCN 2009. 2009 *IUCN Red List of Threatened Species*. www.iucnredlist.org.
- Jones, M. J. & Lace, L. A. 2008. The speckled wood butterflies *Pararge xiphia* and *P. aegeria* (Satyridae) on Madeira: distribution, territorial behaviour and possible competition. *Biol. J. Linn. Soc.* 46: 77-89.
- Kalkman, V.J., Boudot, J-P, Bernard, R., Conze, K-J. , De Knijf, G., Dyatlova, E., Ferreira, S., Jović, M., Ott, J., Riservato E. and Sahlén, G. 2010. *European Red List of Dragonflies*. Luxembourg: Office for Official Publications of the European Communities.
- Kottelat, M. and Freyhof, J. 2007. *Handbook of European freshwater fishes*. Kottelat, Cornol, Switzerland and Freyhof, Berlin, Germany.
- Konvicka, M.; Benes, J.; Cizek, O.; Kopecek, F.; Konvicka, O.; Vitaz, L. 2008. *How too much care kills species: Grassland reserves, agri-environmental schemes and extinction of Colias myrmidone (Lepidoptera: Pieridae) from its former stronghold*. *Journal of Insect Conservation*, 12(5): 519-525.
- Mittermeier, R.A., Robles Gil, P., Hoffmann, M., Pilgrim, J., Brooks, T., Mittermeier, C.G., Lamoreux, J. & Fonseca, G.A.B. 2004. *Hotspots Revisited: Earth's Biologically Richest and Most Endangered Terrestrial Ecoregions*. CEMEX, Conservation International and Agrupación Sierra Madre, Mexico City.
- Nieto, A. and Alexander, K.N.A. 2009. *European Red List of Saproxyllic Beetles*. Luxembourg: Office for Official Publications of the European Communities.
- Poole, A., Pienkowski, M., McCracken, D.I., Petretti, F., Brédy, C. & Deffeyes, C. (eds) 1998. *Mountain livestock farming and EU policy development: Proceedings of the Fifth European Forum on Nature Conservation*

- and Pastoralism, 18-21 September 1996, Cogne, Valle d'Aosta, Italy.* Regione Autonoma Valle d'Aosta, Aosta; & EFNCP, Islay.
- Schweiger, O.; Settele, J.; Kudrna, O.; Klotz, S.; Kühn, I. (2008): Climate change can cause spatial mismatch of trophically interacting species. *Ecology* 89, 3472-3479.
- Settele, J., Kudrna, O., Harpke, A., Kuehn, I., van Swaay, C., Verovnik, R., Warren, M., Wiemers, M., Hanspach, J., Hickler, T., Kuehn, E., van Halder, I., Veling, K., Vliegthart, A., Wynhoff, I. & Schweiger, O. 2008. *Climatic Risk Atlas of European Butterflies*. Biorisk 1, 1-710.
- Temple H.J. and Terry A. 2007. *The status and distribution of European mammals*. Luxembourg: Office for Official Publications of the European Communities.
- Temple H.J. and Terry A. 2009. European Mammals: Status, trends and conservation priorities. *Folia Zoologica*.
- Temple H.J. and Cox, N.A. 2009. *European Red List of Amphibians*. Luxembourg: Office for Official Publications of the European Communities.
- Tucker, M.G. & Heath, M.F. 1994. *Birds in Europe: their Conservation Status*. Cambridge, U.K.: BirdLife International (BirdLife Conservation Series no.3).
- Van Swaay, C.A.M. & Van Strien, A.J. (2008) *The European Butterfly Indicator for Grassland species 1990-2007*. Report VS2008.022, De Vlinderstichting, Wageningen.
- Van Swaay, C.A.M. & Warren, M.S. 1999. *Red Data Book of European butterflies (Rhopalocera)*. Nature and Environment, No. 99, Council of Europe Publishing, Strasbourg.
- Van Swaay, C. A. M. and Warren, M. S. (2003) (Eds). Prime butterfly areas of Europe: Priority sites for conservation. National Reference Centre for Agriculture, Nature Conservation and Fisheries, The Netherlands.
- WWF. 2007. Europe 2007: Gross Domestic Product and Ecological Footprint. World Wide Fund for Nature (WWF).

Appendix 1. Form filled by Butterfly Conservation Europe national focal points

COUNTRY : The Netherlands

THANK YOU, for helping us with our work on the European Red List !

Could you please indicate the quality of the estimation of the distribution / population data you supply:

Indicate here:
 ▼

Very good: nearly all populations are known
Good: there is a distribution atlas available. Although maybe not complete, it gives a good idea on the present distribution. Many other records have been published in books and local papers.
Moderate: I used extensive experience of myself and other specialists to make a best professional judgement.
Poor: for many species I have no idea, but for the most threatened ones I used some limited experience of myself and colleagues.

Could you please indicate the quality of the estimation of the trend you supply:

Indicate here:
 ▼

Very good: I was able to correct for differences in investigation intensity of I could use the results of a butterfly monitoring scheme.
Good: since most of the data is computerised, I was able to make a good comparison.
Moderate: I used extensive experience of myself and other specialists to make a best professional judgement.
Poor: for many species I have no idea, but for the most threatened ones I used some limited experience of myself and colleagues.

General references or remarks:

Red List of The Netherlands: Van Swaay, C.A.M. (2006)
 Basisrapport Rode lijst dagvlinders. Rapport VS2006.002, De Vlinderstichting, Wageningen.

Distribution Atlas: Bos, F.G., Bosveld, M.A., Groenendijk,

Plebeius idas **The Netherlands**

Questions on distribution / population size

For your information, the total area of The **1** lands is **41863 km²**

For this species in the RDB 1999 the **distribution** was indicated as: **<1%** **2**

If changed, give the present distribution: % **(only digits !)**

otherwise choose a class for the present distribution ▼

Optional: Remarks on distribution / population size

3

Because this species has an **Extend of Occurrence (EOO) in Europe < 50000 km² in the RDB of 1998, please fill in as well:**

If known, can you give the **Area of Occupancy (AOO)?**

Unit: km² (preferably as 2x2km squares)

4

km²

If known or estimated: **the number of populations**

5

If known or estimated: **the number of individuals**

6

Are populations severly **fragmented?**

7

Choose ▾

Optional: Remarks on distribution / population size

Questions on trend

For this species in RDB 1999 the **25 year distribution trend** was : **decr 75-100%**

The equivalent **10 year distribution trend** in RDB 1999 was : **decr 40-100%**

8

Distribution trend

9

Has more up to date information become available in the last 10 years (i.e. since the 1999 Red Data Book)?

If YES, put in your information. If NO, do not complete the section **distribution trend** and move on to the section **population trend**.

Choose ▾

If yes, give the distribution trend (e.g. -23): % over 10 years

otherwise choose a class for the distribution trend over 10 years

Population trend

10

Is recent population trend data available (last 10 years)? If YES, please put in the new information. If NO move on to the section **fluctuations**.

Choose ▾

If yes, what is the source:

If yes, give the population trend (e.g. -23): % over 10 years

otherwise choose a class for the population trend over 10 years

Fluctuations

Does the species have strong fluctuations?

11

Choose only if known ! ▾

Optional: Remarks on trend (e.g. data quality, special surveys, sampling method)

Question(s) on conservation measures:

Does it occur in any protected area's?

Choose

12

This is an annex II species. Are Natura 2000 areas assigned for this species?

Unknown

13

Specific references (e.g. distribution atlas)

14

SAVE

COUNTRY : The Netherlands

[Back to general questions](#)

If you have checked your species...

If you have checked all your species, please press the FINISHED-button to inform us your work is done. You still will be able to edit the answers later on...

Add a species...

If you like to add a species to your countrylist, please use the button ADD SPECIES

FINISH !

Add species

Species listed for this country

The orange marked species are indicated as endangered in RDB 1999 OR ANNEX II species OR has an EOO < 50.000 km².

species	EOO RDB 1999	25y trend RDB 1999	10y trend RDB 1999	species	EOO RDB 1999	25y trend RDB 1999	10y trend RDB 1999	species	EOO RDB 1999	25y trend RDB 1999	10y trend RDB 1999
1 <i>Erynnis tages</i>	<1%	decr 75-100%	decr 40-100%	25 <i>Calliphora rubi</i>	>15%	decr 15-25%	decr 6-10%	49 <i>Anolis aeneus</i>	>15%	incr 125-200%	incr 109-130%
2 <i>Salix vortioxys</i>	<1%	extinct	extinct	26 <i>Saxifraga c. album</i>	<1%	decr 75-100%	decr 40-100%	50 <i>Polygala c. album</i>	>15%	incr >200%	incr >130%
3 <i>Parus major</i>	1-5%	decr 50-75%	decr 23-40%	27 <i>Catantopus filix</i>	5-15%	decr 25-50%	decr 10-23%	51 <i>Arenaria levana</i>	>15%	incr 125-200%	incr 109-130%
4 <i>Heterostichus micropheus</i>	1-5%	decr 15-25%	decr 6-10%	28 <i>Culex minimus</i>	<1%	extinct	extinct	52 <i>Hymphala antiocha</i>	<1%	extinct	extinct
5 <i>Carterocephalus palustris</i>	5-15%	decr 15-25%	decr 6-10%	29 <i>Calystroga erubescens</i>	>15%	fluctuating	fluctuating	53 <i>Hymphala polychlora</i>	<1%	decr 75-100%	decr 40-100%
6 <i>Thymelicus lineola</i>	>15%	incr >200%	incr >130%	30 <i>Maculinea arvensis</i>	<1%	extinct	extinct	54 <i>Euphydryas aurinia</i>	<1%	extinct	extinct
7 <i>Thymelicus sylvestris</i>	>15%	decr 15-25%	decr 6-10%	31 <i>Maculinea teleus</i>	<1%	decr 75-100%	decr 40-100%	55 <i>Melitaea cinxia</i>	<1%	decr 75-100%	decr 40-100%
8 <i>Thymelicus acteon</i>	<1%	extinct	extinct	32 <i>Maculinea nausithous</i>	<1%	decr 75-100%	decr 40-100%	56 <i>Melitaea didymata</i>	<1%	extinct	extinct
9 <i>Haeseria comma</i>	5-15%	decr 25-50%	decr 10-23%	33 <i>Maculinea alcon</i>	5-15%	decr 75-100%	decr 40-100%	57 <i>Melitaea athalia</i>	1-5%	decr 50-75%	decr 23-40%
10 <i>Ochlodes venata</i>	>15%	incr 125-200%	incr 109-130%	34 <i>Plebejus spondus</i>	>15%	decr 25-50%	decr 10-23%	58 <i>Limenitis populi</i>	<1%	unknown	unknown
11 <i>Papilio machaon</i>	5-15%	decr 25-50%	decr 10-23%	35 <i>Plebejus ides</i>	<1%	extinct	extinct	59 <i>Limenitis camilla</i>	5-15%	decr 25-50%	decr 10-23%
12 <i>Lepidoptera sinensis</i>				36 <i>Plebejus castle</i>	<1%	decr 25-50%	decr 10-23%	60 <i>Anartura vitis</i>	1-5%	decr 50-75%	decr 23-40%
13 <i>Anthocharis cardamines</i>	>15%	stable	stable	37 <i>Ancia aspersa</i>	>15%	stable	stable	61 <i>Pararge aegeria</i>	>15%	incr 125-200%	incr 109-130%
14 <i>Agrotis cynthia</i>	<1%	extinct	extinct	38 <i>Polyommatus semitorus</i>	<1%	decr 75-100%	decr 40-100%	62 <i>Lasiommata megera</i>	>15%	stable	stable
15 <i>Pieris brassicae</i>	>15%	incr 125-200%	incr 109-130%	39 <i>Polyommatus icarus</i>	>15%	decr 15-25%	decr 6-10%	63 <i>Ceanothympha tullia</i>	<1%	decr 75-100%	decr 40-100%
16 <i>Pieris rapae</i>	>15%	incr 125-200%	incr 109-130%	40 <i>Argynnis paphia</i>	<1%	extinct	extinct	64 <i>Ceanothympha arcania</i>	<1%	extinct	extinct
17 <i>Pieris napi</i>	>15%	incr >200%	incr >130%	41 <i>Argynnis agestis</i>	1-5%	decr 50-75%	decr 23-40%	65 <i>Ceanothympha hera</i>	<1%	extinct	extinct
18 <i>Gonostercus rhamni</i>	>15%	incr 125-200%	incr 109-130%	42 <i>Argynnis nioche</i>	5-15%	decr 50-75%	decr 23-40%	66 <i>Ceanothympha pamphilus</i>	>15%	decr 50-75%	decr 23-40%
19 <i>Lycæna phlaxa</i>	>15%	stable	stable	43 <i>Iaxone lethymia</i>	5-15%	decr 50-75%	decr 23-40%	67 <i>Pyronia tithonus</i>	>15%	incr 125-200%	incr 109-130%
20 <i>Lycæna viridula</i>	<1%	decr 75-100%	decr 40-100%	44 <i>Brenthis ino</i>	<1%	extinct	extinct	68 <i>Aphantopus hyperantus</i>	>15%	incr 125-200%	incr 109-130%
21 <i>Lycæna tityrus</i>	>15%	decr 25-50%	decr 10-23%	45 <i>Bolonia euephorina</i>	<1%	extinct	extinct	69 <i>Haniola lactinea</i>	>15%	incr 125-200%	incr 109-130%
22 <i>Lycæna hipparchus</i>	<1%	extinct	extinct	46 <i>Bolonia salene</i>	1-5%	decr 75-100%	decr 40-100%	70 <i>Hipparchia semele</i>	>15%	decr 25-50%	decr 10-23%
23 <i>Thaïs benalis</i>	1-5%	decr 50-75%	decr 23-40%	47 <i>Bolonia agulionans</i>	1-5%	decr 25-50%	decr 10-23%	71 <i>Hipparchia statilinus</i>	1-5%	decr 50-75%	decr 23-40%
24 <i>Nesiothrus quercus</i>	>15%	stable	stable	48 <i>Inachis is</i>	>15%	incr 125-200%	incr 109-130%				

Appendix 2. Red List status of European butterflies

Species are sorted alphabetically by family, genus and species.

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
HESPERIIDAE						
<i>Borbo borbonica</i> (Boisduval, 1833)	NA		NA			
<i>Carcharodus alceae</i> (Esper, 1780)	LC		LC			
<i>Carcharodus baeticus</i> (Rambur, 1839)	LC		LC		Yes	
<i>Carcharodus flocciferus</i> (Zeller, 1847)	NT	A2c	LC			
<i>Carcharodus lavatherae</i> (Esper, 1783)	NT	A2c	NT	A2c		
<i>Carcharodus orientalis</i> Reverdin, 1913	LC		LC			
<i>Carcharodus stauderi</i> Reverdin, 1913	NA		NA			
<i>Carcharodus tripolinus</i> (Verity, 1925)	LC		LC			
<i>Carterocephalus palaemon</i> (Pallas, 1771)	LC		LC			
<i>Carterocephalus silvicolus</i> (Meigen, 1829)	LC		LC			
<i>Erynnis marloyi</i> (Boisduval, 1834)	LC		LC			
<i>Erynnis tages</i> (Linnaeus, 1758)	LC		LC			
<i>Gegenes nostradamus</i> (Fabricius, 1793)	LC		LC			
<i>Gegenes pumilio</i> (Hoffmannsegg, 1804)	LC		LC			
<i>Hesperia comma</i> (Linnaeus, 1758)	LC		LC			
<i>Heteropterus morpheus</i> (Pallas, 1771)	LC		LC			
<i>Muschampia cribellum</i> (Eversmann, 1841)	NT	B2a	NT	B2a		
<i>Muschampia proto</i> (Ochsenheimer, 1808)	LC		LC			
<i>Muschampia tessellum</i> (Hübner, 1803)	LC		LC			
<i>Ochlodes sylvanus</i> (Esper, 1777)	LC		LC			
<i>Pelopidas thrax</i> (Hübner, 1821)	NA		NA			
<i>Pyrgus alveus</i> (Hübner, 1803)	LC		LC			
<i>Pyrgus andromedae</i> (Wallengren, 1853)	LC		LC		Yes	
<i>Pyrgus armoricanus</i> (Oberthür, 1910)	LC		LC			
<i>Pyrgus bellieri</i> (Oberthür, 1910)	LC		LC		Yes	Yes
<i>Pyrgus cacaliae</i> (Rambur, 1839)	LC		LC		Yes	
<i>Pyrgus carlinae</i> (Rambur, 1839)	LC		LC		Yes	
<i>Pyrgus carthami</i> (Hübner, 1813)	LC		LC			
<i>Pyrgus centaureae</i> (Rambur, 1839)	LC		LC			
<i>Pyrgus cinarae</i> (Rambur, 1839)	LC		LC			
<i>Pyrgus cirsii</i> (Rambur, 1839)	VU	A2c	VU	A2c	Yes	
<i>Pyrgus malvae</i> (Linnaeus, 1758)	LC		LC			
<i>Pyrgus malvoides</i> (Elwes & Edwards, 1897)	LC		LC		Yes	
<i>Pyrgus onopordi</i> (Rambur, 1839)	LC		LC			
<i>Pyrgus serratulae</i> (Rambur, 1839)	LC		NT			
<i>Pyrgus sidae</i> (Esper, 1784)	LC		LC			
<i>Pyrgus warrenensis</i> (Verity, 1928)	LC		LC		Yes	
<i>Spialia orbifer</i> (Hübner, 1823)	LC		LC			
<i>Spialia phlomidis</i> (Herrich-Schäffer, 1845)	LC		LC			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Spialia sertorius</i> (Hoffmannsegg, 1804)	LC		LC			
<i>Spialia therapne</i> (Rambur, 1832)	LC		LC		Yes	Yes
<i>Thymelicus acteon</i> (Rottemburg, 1775)	NT	A2b	NT	A2b		
<i>Thymelicus christi</i> (Rebel, 1894)	LC		LC		Yes	Yes
<i>Thymelicus hyrax</i> (Lederer, 1861)	LC		LC			
<i>Thymelicus lineola</i> (Ochsenheimer, 1808)	LC		LC			
<i>Thymelicus sylvestris</i> (Poda, 1761)	LC		LC			
LYCAENIDAE						
<i>Apharitis acamas</i> (Klug, 1834)	NA		NA			
<i>Aricia agestis</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Aricia anteros</i> (Freyer, 1838)	NT	A2c	LC			
<i>Aricia artaxerxes</i> (Fabricius, 1793)	LC		LC			
<i>Aricia cramera</i> (Eschscholtz, 1821)	LC		LC			
<i>Aricia eumedon</i> (Esper, 1780)	LC		LC			
<i>Aricia hyacinthus</i> (Herrich-Schäffer, 1847)	RE		RE			
<i>Aricia montensis</i> Verity, 1928	LC		LC			
<i>Aricia morronensis</i> Ribbe, 1910	LC		LC		Yes	
<i>Aricia nicias</i> (Meigen, 1830)	LC		LC			
<i>Azanus ubaldus</i> (Stoll, 1782)	NA		NA			
<i>Cacyreus marshalli</i> Butler, 1898	NA		NA			
<i>Callophrys avis</i> Chapman, 1909	LC		LC			
<i>Callophrys chalybeitincta</i> Sovinsky, 1905	NA		NA			
<i>Callophrys rubi</i> (Linnaeus, 1758)	LC		LC			
<i>Callophrys suaveola</i> (Staudinger, 1881)	NA		NA			
<i>Celastrina argiolus</i> (Linnaeus, 1758)	LC		LC			
<i>Chilades galba</i> (Lederer, 1855)	NA		NA			
<i>Chilades trochylus</i> (Freyer, 1845)	LC		LC			
<i>Cupido alcetas</i> (Hoffmannsegg, 1804)	LC		LC			
<i>Cupido argiades</i> (Pallas, 1771)	LC		LC			
<i>Cupido decoloratus</i> (Staudinger, 1886)	NT	A2c	LC			
<i>Cupido lorquini</i> (Herrich-Schäffer, 1847)	LC		LC			
<i>Cupido minimus</i> (Fuessly, 1775)	LC		LC			
<i>Cupido osiris</i> (Meigen, 1829)	LC		LC			
<i>Cyaniris semiargus</i> (Rottemburg, 1775)	LC		LC			
<i>Cyclus webbianus</i> (Brullé, 1839)	LC		LC		Yes	Yes
<i>Favonius quercus</i> (Linnaeus, 1758)	LC		LC			
<i>Glaucopsyche alexis</i> (Poda, 1761)	LC		LC			
<i>Glaucopsyche melanops</i> (Boisduval, 1828)	LC		LC			
<i>Glaucopsyche paphos</i> Chapman, 1920	LC		LC		Yes	Yes
<i>Iolana iolas</i> (Ochsenheimer, 1816)	NT	A2c	NT	A2c		
<i>Laeosopis roboris</i> (Esper, 1789)	LC		LC		Yes	
<i>Lampides boeticus</i> (Linnaeus, 1767)	LC		LC			
<i>Leptotes pirithous</i> (Linnaeus, 1767)	LC		LC			
<i>Lycaena alciphron</i> (Rottemburg, 1775)	LC		NT			
<i>Lycaena bleusei</i> Oberthür, 1884	LC		LC		Yes	Yes
<i>Lycaena candens</i> (Herrich-Schäffer, 1844)	LC		LC			
<i>Lycaena dispar</i> (Haworth, 1802)	LC		LC			
<i>Lycaena helle</i> (Denis & Schiffermüller, 1775)	EN	A2c	LC			
<i>Lycaena hippothoe</i> (Linnaeus, 1761)	LC		NT			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Lycaena ottomana</i> (Lefèbvre, 1830)	LC		LC			
<i>Lycaena phlaeas</i> (Linnaeus, 1761)	LC		LC			
<i>Lycaena thersamon</i> (Esper, 1784)	LC		LC			
<i>Lycaena thetis</i> Klug, 1834	NA		NA			
<i>Lycaena tityrus</i> (Poda, 1761)	LC		LC			
<i>Lycaena virgaureae</i> (Linnaeus, 1758)	LC		LC			
<i>Neolycaena rhymnus</i> (Eversmann, 1832)	LC		NE			
<i>Phengaris alcon</i> (Denis & Schiffermüller, 1775)	LC		NT	A2c		
<i>Phengaris arion</i> (Linnaeus, 1758)	EN	A2bc	EN	A2bc		
<i>Phengaris nausithous</i> (Bergsträsser, 1779)	NT	A2c	NT	A2c		
<i>Phengaris teleius</i> (Bergsträsser, 1779)	VU	A2c	VU	A2c		
<i>Plebejus aquilo</i> (Boisduval, 1832)	LC		LC			
<i>Plebejus argus</i> (Linnaeus, 1758)	LC		LC			
<i>Plebejus argyrognomon</i> (Bergsträsser, 1779)	LC		LC			
<i>Plebejus bellieri</i> (Oberthür, 1910)	LC		LC		Yes	Yes
<i>Plebejus dardanus</i> (Freyer, 1844)	NT	B1a	NT	B1a		
<i>Plebejus eurypilus</i> (Freyer, 1851)	NA		NA			
<i>Plebejus glandon</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Plebejus hespericus</i> (Rambur, 1839)	LC		LC		Yes	Yes
<i>Plebejus idas</i> (Linnaeus, 1761)	LC		LC			
<i>Plebejus loewii</i> (Zeller, 1847)	NA		NA			
<i>Plebejus optilete</i> (Knoch, 1781)	LC		LC			
<i>Plebejus orbitulus</i> (de Prunner, 1798)	LC		LC			
<i>Plebejus psyloritus</i> (Freyer, 1845)	LC		LC		Yes	Yes
<i>Plebejus pylaon</i> (Fischer, 1832)	NT	A2c	NE			
<i>Plebejus pyrenaicus</i> (Boisduval, 1840)	LC		LC		Yes	Yes
<i>Plebejus sephirus</i> (Friedländer, 1835)	LC		LC			
<i>Plebejus trappi</i> (Verity, 1927)	NT	B1b(v)+ 2b(v)	LC		Yes	
<i>Plebejus zulichchi</i> (Hemming, 1933)	EN	B1b(iv)c(iv)+ 2b(iv)c(iv)	EN	B1b(iv)c(iv)+ 2b(iv)c(iv)	Yes	Yes
<i>Polyommatus admetus</i> (Esper, 1783)	LC		LC			
<i>Polyommatus albicans</i> (Gerhard, 1851)	LC		LC			
<i>Polyommatus amandus</i> (Schneider, 1792)	LC		LC			
<i>Polyommatus aroaniensis</i> (Brown, 1976)	LC		LC		Yes	Yes
<i>Polyommatus bellargus</i> (Rottemburg, 1775)	LC		LC			
<i>Polyommatus caelestissimus</i> Verity, 1921	LC		LC		Yes	Yes
<i>Polyommatus coelestinus</i> (Eversmann, 1843)	LC		LC			
<i>Polyommatus coridon</i> (Poda, 1761)	LC		LC		Yes	
<i>Polyommatus corydonius</i> (Herrich-Schäffer, [1852])	LC		NE			
<i>Polyommatus cyane</i> (Eversmann, 1837)	NA		NA			
<i>Polyommatus damocles</i> (Herrich-Schäffer, 1844)	DD		NE			
<i>Polyommatus damon</i> (Denis & Schiffermüller, 1775)	NT	A2c	NT	A2c		
<i>Polyommatus damone</i> (Eversmann, 1841)	NA		NA			
<i>Polyommatus daphnis</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Polyommatus dolus</i> (Hübner, 1823)	LC		LC		Yes	Yes

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Polyommatus dorylas</i> (Denis & Schiffermüller, 1775)	NT	A2c	NT	A2c		
<i>Polyommatus eleniae</i> Coutsis & De Prins, 2005	DD		DD		Yes	Yes
<i>Polyommatus eros</i> (Ochsenheimer, 1808)	NT	A2c	NT	A2c		
<i>Polyommatus escheri</i> (Hübner, 1823)	LC		LC			
<i>Polyommatus fabressei</i> (Oberthür, 1910)	LC		LC		Yes	Yes
<i>Polyommatus fulgens</i> (de Sagarra, 1925)	LC		LC		Yes	Yes
<i>Polyommatus galloi</i> Balletto & Toso, 1979	VU	B2ab(iv)c(iv)	VU	B2ab(iv)c(iv)	Yes	Yes
<i>Polyommatus golgus</i> (Hübner, 1813)	VU	D2	VU	D2	Yes	Yes
<i>Polyommatus hispanus</i> (Herrich-Schäffer, 1851)	LC		LC		Yes	Yes
<i>Polyommatus humedasaе</i> Toso & Balletto, 1976	EN	B1ab(iii,v)+ 2ab(iii,v)	EN	B1ab(iii,v)+ 2ab(iii,v)	Yes	Yes
<i>Polyommatus icarus</i> (Rottemburg, 1775)	LC		LC			
<i>Polyommatus iphigenia</i> (Herrich-Schäffer, 1847)	NA		NA			
<i>Polyommatus nephohiptamenos</i> (Brown & Coutsis, 1978)	NT		NT		Yes	Yes
<i>Polyommatus nivescens</i> Keferstein, 1851	NT		NT		Yes	Yes
<i>Polyommatus orphicus</i> Kolev, 2005	VU	B2ab(iii,iv,v)	VU	B2ab(iii,iv,v)	Yes	Yes
<i>Polyommatus pljushtchi</i> Lukhtanov & Budashkin, 1993	DD		DD		Yes	
<i>Polyommatus ripartii</i> (Freyer, 1830)	LC		NT	A2c		
<i>Polyommatus thersites</i> (Cantener, 1835)	LC		LC			
<i>Polyommatus violetae</i> (Gomez-Bustillo <i>et al.</i> , 1979)	VU	D2	VU	D2	Yes	Yes
<i>Praephilotes anthracias</i> (Christoph, 1877)	NA		NA			
<i>Pseudophilotes abencerragus</i> (Pierret, 1837)	LC		LC			
<i>Pseudophilotes barbaggiae</i> De Prins & van der Poorten, 1982	LC		LC		Yes	Yes
<i>Pseudophilotes baton</i> (Bergsträsser, 1779)	LC		LC		Yes	
<i>Pseudophilotes bavius</i> (Eversmann, 1832)	LC		LC			
<i>Pseudophilotes panope</i> (Eversmann, 1851)	NA		NA			
<i>Pseudophilotes panoptes</i> (Hübner, 1813)	NT		NT		Yes	Yes
<i>Pseudophilotes vicrama</i> (Moore, 1865)	NT	A2c	NT	A2c		
<i>Satyrium acaciae</i> (Fabricius, 1787)	LC		LC			
<i>Satyrium esculi</i> (Hübner, 1804)	LC		LC			
<i>Satyrium ilicis</i> (Esper, 1779)	LC		LC			
<i>Satyrium ledereri</i> (Boisduval, 1848)	NA		NA			
<i>Satyrium pruni</i> (Linnaeus, 1758)	LC		LC			
<i>Satyrium spini</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Satyrium w-album</i> (Knoch, 1782)	LC		LC			
<i>Scolitantides orion</i> (Pallas, 1771)	LC		NT			
<i>Tarucus balkanicus</i> (Freyer, 1844)	LC		LC			
<i>Tarucus theophrastus</i> (Fabricius, 1793)	LC		LC			
<i>Thecla betulae</i> (Linnaeus, 1758)	LC		LC			
<i>Tomares ballus</i> (Fabricius, 1787)	LC		LC			
<i>Tomares callimachus</i> (Eversmann, 1848)	LC		NE			
<i>Tomares nogelii</i> (Herrich-Schäffer, 1851)	VU	A2c	RE			
<i>Tongeia fischeri</i> (Eversmann, 1843)	NA		NA			
<i>Turanana taygetica</i> (Rebel, 1902)	EN	B2ab(iii)	EN	B2ab(iii)		

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Zizeeria karsandra</i> (Moore, 1865)	NA		NA			
<i>Zizeeria knysna</i> (Trimen, 1862)	NA		NA			
NYMPHALIDAE						
<i>Aglais ichnusa</i> (Bonelli, 1826)	LC		LC		Yes	Yes
<i>Aglais io</i> (Linnaeus, 1758)	LC		LC			
<i>Aglais urticae</i> (Linnaeus, 1758)	LC		LC			
<i>Apatura ilia</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Apatura iris</i> (Linnaeus, 1758)	LC		LC			
<i>Apatura metis</i> Freyer, 1829	LC		LC			
<i>Aphantopus hyperantus</i> (Linnaeus, 1758)	LC		LC			
<i>Araschnia levana</i> (Linnaeus, 1758)	LC		LC			
<i>Arethusana arethusa</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Argynnis adippe</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Argynnis aglaja</i> (Linnaeus, 1758)	LC		LC			
<i>Argynnis elisa</i> Godart, 1823	LC		LC		Yes	Yes
<i>Argynnis laodice</i> (Pallas, 1771)	LC		NT	A2c		
<i>Argynnis niobe</i> (Linnaeus, 1758)	LC		NT	A2c		
<i>Argynnis pandora</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Argynnis paphia</i> (Linnaeus, 1758)	LC		LC			
<i>Boloria alaskensis</i> (Holland, 1900)	NA		NA			
<i>Boloria angarensis</i> (Erschoff, 1870)	NA		NA			
<i>Boloria aquilonaris</i> (Stichel, 1908)	LC		LC			
<i>Boloria chariclea</i> (Schneider, 1794)	NT	A3c	NT	A3c		
<i>Boloria dia</i> (Linnaeus, 1767)	LC		LC			
<i>Boloria eunomia</i> (Esper, 1799)	LC		LC			
<i>Boloria euphrosyne</i> (Linnaeus, 1758)	LC		LC			
<i>Boloria freija</i> (Becklin, 1791)	LC		LC			
<i>Boloria frigga</i> (Becklin, 1791)	LC		LC			
<i>Boloria graeca</i> (Staudinger, 1870)	LC		LC			
<i>Boloria improba</i> (Butler, 1877)	EN	B2c(iv)	EN	B2c(iv)		
<i>Boloria napaea</i> (Hoffmannsegg, 1804)	LC		LC			
<i>Boloria oscarus</i> (Eversmann, 1844)	NA		NA			
<i>Boloria pales</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Boloria polaris</i> (Boisduval, 1828)	VU	A4c	VU	A4c		
<i>Boloria selene</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Boloria selenis</i> (Eversmann, 1837)	LC		NE			
<i>Boloria thore</i> (Hübner, 1803)	LC		LC			
<i>Boloria titania</i> (Esper, 1793)	NT	A2c	LC			
<i>Boloria tritonia</i> (Böber, 1812)	NA		NA			
<i>Brenthis daphne</i> (Bergsträsser, 1780)	LC		LC			
<i>Brenthis hecate</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Brenthis ino</i> (Rottemburg, 1775)	LC		LC			
<i>Brintesia circe</i> (Fabricius, 1775)	LC		LC			
<i>Charaxes jasius</i> (Linnaeus, 1767)	LC		LC			
<i>Chazara briseis</i> (Linnaeus, 1764)	NT	A2c	NT	A2c		
<i>Chazara persephone</i> (Hübner, 1805)	LC		NE			
<i>Chazara prieuri</i> (Pierret, 1837)	LC		LC			
<i>Coenonympha amaryllis</i> (Stoll, 1782)	NA		NA			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Coenonympha arcania</i> (Linnaeus, 1761)	LC		LC			
<i>Coenonympha corinna</i> (Hübner, 1806)	LC		LC		Yes	Yes
<i>Coenonympha dorus</i> (Esper, 1782)	LC		LC			
<i>Coenonympha gardetta</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Coenonympha glycerion</i> (Borkhausen, 1788)	LC		LC			
<i>Coenonympha hero</i> (Linnaeus, 1761)	VU	A2c	VU	A2c		
<i>Coenonympha leander</i> (Esper, 1784)	LC		LC			
<i>Coenonympha oedippus</i> (Fabricius, 1787)	EN	A2c	LC			
<i>Coenonympha orientalis</i> Rebel, 1910	VU	A2c	DD		Yes	
<i>Coenonympha pamphilus</i> (Linnaeus, 1758)	LC		LC			
<i>Coenonympha phryne</i> (Pallas, 1771)	CR	A2c	NE			
<i>Coenonympha rhodopensis</i> Elwes, 1900	LC		LC		Yes	
<i>Coenonympha thyrus</i> (Freyer, 1845)	LC		LC		Yes	Yes
<i>Coenonympha tullia</i> (Müller, 1764)	VU	A2c	NT	A2c		
<i>Danaus chrysippus</i> (Linnaeus, 1758)	NA		NA			
<i>Danaus plexippus</i> (Linnaeus, 1758)	NA		NA			
<i>Erebia aethiopella</i> (Hoffmannsegg, 1806)	LC		LC		Yes	Yes
<i>Erebia aethiops</i> (Esper, 1777)	LC		LC			
<i>Erebia alberganus</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Erebia calcaria</i> Lorković, 1953	LC		LC		Yes	Yes
<i>Erebia cassioides</i> (Reiner & Hohenwarth, 1792)	LC		LC		Yes	
<i>Erebia christi</i> Rätzer, 1890	VU	B2ab(iii,v)	VU	B2ab(iii,v)	Yes	
<i>Erebia claudina</i> (Borkhausen, 1789)	NT	A2c	NT	A2c	Yes	Yes
<i>Erebia cyclopius</i> (Eversmann, 1844)	NA		NA			
<i>Erebia dabanensis</i> Erschoff, 1871	NA		NA			
<i>Erebia disa</i> (Thunberg, 1791)	LC		LC			
<i>Erebia discoidalis</i> (Kirby, 1837)	LC		NE			
<i>Erebia edda</i> Ménétriés, 1851	NA		NA			
<i>Erebia embla</i> (Thunberg, 1791)	LC		LC			
<i>Erebia epiphron</i> (Knoch, 1783)	LC		LC		Yes	
<i>Erebia epistygne</i> (Hübner, 1819)	NT		NT		Yes	Yes
<i>Erebia eriphyle</i> (Freyer, 1836)	LC		LC		Yes	
<i>Erebia euryale</i> (Esper, 1805)	LC		LC			
<i>Erebia fasciata</i> Butler, 1868	NA		NA			
<i>Erebia flavofasciata</i> Heyne, 1895	NT		NT		Yes	
<i>Erebia gorge</i> (Hübner, 1804)	LC		LC		Yes	
<i>Erebia gorgone</i> Boisduval, 1833	LC		LC		Yes	
<i>Erebia hispania</i> Butler, 1868	LC		LC		Yes	
<i>Erebia jenseiensis</i> Trybom, 1877	NA		NA			
<i>Erebia lefebvrei</i> (Boisduval, 1828)	LC		LC		Yes	
<i>Erebia ligea</i> (Linnaeus, 1758)	LC		LC			
<i>Erebia manto</i> (Denis & Schiffermüller, 1775)	LC		LC		Yes	
<i>Erebia medusa</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Erebia melampus</i> (Fuessly, 1775)	LC		LC		Yes	
<i>Erebia melas</i> (Herbst, 1796)	LC		LC		Yes	
<i>Erebia meolans</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Erebia mnestra</i> (Hübner, 1804)	LC		LC		Yes	
<i>Erebia montana</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Erebia neoridas</i> (Boisduval, 1828)	LC		LC		Yes	

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Erebia nivalis</i> Lorković & De Lesse, 1954	LC		LC		Yes	
<i>Erebia oeme</i> (Hübner, 1804)	LC		LC		Yes	
<i>Erebia orientalis</i> Elwes, 1900	LC		LC		Yes	
<i>Erebia ottomana</i> Herrich-Schäffer, 1847	LC		LC			
<i>Erebia palarica</i> Chapman, 1905	LC		LC		Yes	Yes
<i>Erebia pandrose</i> (Borkhausen, 1788)	LC		LC			
<i>Erebia pharte</i> (Hübner, 1804)	LC		LC		Yes	
<i>Erebia pluto</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Erebia polaris</i> Staudinger, 1871	LC		LC			
<i>Erebia pronoe</i> (Esper, 1780)	LC		LC		Yes	
<i>Erebia rhodopensis</i> Nicholl, 1900	LC		LC		Yes	
<i>Erebia rondoui</i> Oberthür, 1908	LC		LC		Yes	Yes
<i>Erebia rossii</i> (Curtis, 1834)	NA		NA			
<i>Erebia scipio</i> Boisduval, 1832	LC		LC		Yes	Yes
<i>Erebia shennygo</i> Graslín, 1850	LC		LC		Yes	Yes
<i>Erebia stiria</i> (Godart, 1824)	LC		LC		Yes	
<i>Erebia styx</i> (Freyer, 1834)	LC		LC		Yes	
<i>Erebia sudetica</i> Staudinger, 1861	VU	A2c	VU	A2c	Yes	
<i>Erebia triaria</i> (de Prunner, 1798)	LC		LC		Yes	
<i>Erebia tyndarus</i> (Esper, 1781)	LC		LC		Yes	
<i>Erebia zapateri</i> Oberthür, 1875	LC		LC		Yes	Yes
<i>Euphydryas aurinia</i> (Rottemburg, 1775)	LC		LC			
<i>Euphydryas cynthia</i> (Denis & Schiffermüller, 1775)	LC		LC		Yes	
<i>Euphydryas desfontainii</i> (Godart, 1819)	NT	A3c	NT	A3c		
<i>Euphydryas iduna</i> (Dalman, 1816)	NT	A3c	NT	A3c		
<i>Euphydryas intermedia</i> (Ménétriés, 1859)	LC		LC			
<i>Euphydryas maturna</i> (Linnaeus, 1758)	VU	A2c	LC			
<i>Hipparchia aristaeus</i> (Bonelli, 1826)	LC		LC		Yes	Yes
<i>Hipparchia autonoe</i> (Esper, 1783)	LC		NE			
<i>Hipparchia azorina</i> (Strecker, 1898)	LC		LC		Yes	Yes
<i>Hipparchia bacchus</i> Higgins, 1967	VU	D2	VU	D2	Yes	Yes
<i>Hipparchia christenseni</i> Kudrna, 1977	LC		LC		Yes	Yes
<i>Hipparchia cretica</i> (Rebel, 1916)	LC		LC		Yes	Yes
<i>Hipparchia cypriensis</i> Holik, 1949	LC		LC		Yes	Yes
<i>Hipparchia fagi</i> (Scopoli, 1763)	NT		NT		Yes	
<i>Hipparchia fatua</i> Freyer, 1844	LC		LC			
<i>Hipparchia fidia</i> (Linnaeus, 1767)	LC		LC			
<i>Hipparchia gomera</i> Higgins, 1967	LC		LC		Yes	Yes
<i>Hipparchia hermione</i> (Linnaeus, 1764)	NT	A2c	NT	A2c		
<i>Hipparchia leighebi</i> Kudrna, 1976	NT	B2a	NT	B2a	Yes	Yes
<i>Hipparchia maderensis</i> (Bethune-Baker, 1891)	LC		LC		Yes	Yes
<i>Hipparchia mersina</i> (Staudinger, 1871)	NA		NA			
<i>Hipparchia miguelensis</i> (Le Cerf, 1935)	LC		LC		Yes	Yes
<i>Hipparchia neapolitana</i> Stauder, 1921	LC		LC		Yes	Yes
<i>Hipparchia neomiris</i> (Godart, 1822)	LC		LC		Yes	Yes
<i>Hipparchia pellucida</i> (Stauder, 1923)	LC		LC			
<i>Hipparchia sbordonii</i> Kudrna, 1984	NT	B1a+2a	NT	B1a+2a	Yes	Yes
<i>Hipparchia semele</i> (Linnaeus, 1758)	LC		LC		Yes	

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Hipparchia senthes</i> (Fruhstorfer, 1908)	LC		LC			
<i>Hipparchia statilinus</i> (Hufnagel, 1766)	NT	A2c	NT	A2c		
<i>Hipparchia syriaca</i> (Staudinger, 1871)	LC		LC			
<i>Hipparchia tamadabae</i> Owen & Smith, 1992	LC		LC		Yes	Yes
<i>Hipparchia tilosi</i> (Manil, 1984)	VU	D2	VU	D2	Yes	Yes
<i>Hipparchia volgensis</i> (Mazochin-Porshnjakov, 1952)	LC		LC		Yes	
<i>Hipparchia wyssii</i> (Christ, 1889)	LC		LC		Yes	Yes
<i>Hyponephele huebneri</i> Koçak, 1980	NA		NA			
<i>Hyponephele lupina</i> (Costa, 1836)	LC		LC			
<i>Hyponephele lycan</i> (Kühn, 1774)	LC		LC			
<i>Issoria eugenia</i> (Eversmann, 1847)	NA		NA			
<i>Issoria lathonia</i> (Linnaeus, 1758)	LC		LC			
<i>Kirinia climene</i> (Esper, 1783)	LC		LC			
<i>Kirinia roxelana</i> (Cramer, 1777)	LC		LC			
<i>Lasiommata maera</i> (Linnaeus, 1758)	LC		LC			
<i>Lasiommata megera</i> (Linnaeus, 1767)	LC		LC			
<i>Lasiommata paramegaera</i> (Hübner, 1824)	LC		LC		Yes	Yes
<i>Lasiommata petropolitana</i> (Fabricius, 1787)	LC		LC			
<i>Libythea celtis</i> (Laicharting, 1782)	LC		LC			
<i>Limenitis camilla</i> (Linnaeus, 1764)	LC		LC			
<i>Limenitis populi</i> (Linnaeus, 1758)	LC		NT			
<i>Limenitis reducta</i> Staudinger, 1901	LC		LC			
<i>Lopinga achine</i> (Scopoli, 1763)	VU	A2c	VU	A2c		
<i>Lopinga deidamia</i> (Eversmann, 1851)	NA		NA			
<i>Maniola chia</i> Thomson, 1987	LC		LC		Yes	Yes
<i>Maniola cypricola</i> (Graves, 1928)	LC		LC		Yes	Yes
<i>Maniola halicarnassus</i> Thomson, 1990	NT	B1a	NT	B1a		
<i>Maniola jurtina</i> (Linnaeus, 1758)	LC		LC			
<i>Maniola megala</i> (Oberthür, 1909)	NA		NA			
<i>Maniola nurag</i> Ghiliani, 1852	LC		LC		Yes	Yes
<i>Maniola telmessia</i> (Zeller, 1847)	LC		LC			
<i>Melanargia arge</i> (Sulzer, 1776)	LC		LC		Yes	Yes
<i>Melanargia galathea</i> (Linnaeus, 1758)	LC		LC			
<i>Melanargia ines</i> (Hoffmannsegg, 1804)	LC		LC			
<i>Melanargia lachesis</i> (Hübner, 1790)	LC		LC		Yes	
<i>Melanargia larissa</i> (Geyer, 1828)	LC		LC			
<i>Melanargia occitanica</i> (Esper, 1793)	LC		LC			
<i>Melanargia pherusa</i> (Boisduval, 1833)	LC		LC		Yes	Yes
<i>Melanargia russiae</i> (Esper, 1783)	LC		LC			
<i>Melitaea aetherie</i> (Hübner, 1826)	LC		LC			
<i>Melitaea arduinna</i> (Esper, 1783)	LC		LC			
<i>Melitaea asteria</i> Freyer, 1828	LC		LC		Yes	
<i>Melitaea athalia</i> (Rottemburg, 1775)	LC		LC			
<i>Melitaea aurelia</i> Nickerl, 1850	NT	A2c	LC			
<i>Melitaea britomartis</i> Assmann, 1847	NT	A2c	NT	A2c		
<i>Melitaea cinxia</i> (Linnaeus, 1758)	LC		LC			
<i>Melitaea deione</i> (Geyer, 1832)	LC		LC			
<i>Melitaea diamina</i> (Lang, 1789)	LC		NT			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Melitaea didyma</i> (Esper, 1778)	LC		LC			
<i>Melitaea parthenoides</i> Keferstein, 1851	LC		LC		Yes	
<i>Melitaea phoebe</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Melitaea telona</i> Fruhstorfer, 1908	DD		DD			
<i>Melitaea trivialis</i> (Denis & Schiffermüller, 1775)	LC		NT			
<i>Melitaea varia</i> Meyer-Dür, 1851	LC		LC		Yes	
<i>Minois dryas</i> (Scopoli, 1763)	LC		LC			
<i>Neptis rivularis</i> (Scopoli, 1763)	LC		LC			
<i>Neptis sappho</i> (Pallas, 1771)	LC		LC			
<i>Nymphalis antiopa</i> (Linnaeus, 1758)	LC		LC			
<i>Nymphalis polychloros</i> (Linnaeus, 1758)	LC		VU	A2c		
<i>Nymphalis vaualbum</i> (Denis & Schiffermüller 1775)	LC		LC			
<i>Nymphalis xanthomelas</i> (Esper, 1781)	LC		NT	A2c		
<i>Oeneis bore</i> (Schneider, 1792)	LC		LC			
<i>Oeneis glacialis</i> (Moll, 1783)	LC		LC		Yes	
<i>Oeneis jutta</i> (Hübner, 1806)	LC		LC			
<i>Oeneis magna</i> Graeser, 1888	NA		NA			
<i>Oeneis melissa</i> (Fabricius, 1775)	NA		NA			
<i>Oeneis norna</i> (Thunberg, 1791)	NT	A3c	NT	A3c		
<i>Oeneis polixenes</i> (Fabricius, 1775)	NA		NA			
<i>Oeneis tarpeia</i> (Pallas, 1771)	LC		NE			
<i>Pararge aegeria</i> (Linnaeus, 1758)	LC		LC			
<i>Pararge xiphia</i> (Fabricius, 1775)	EN	B1ab(iii,v)	EN	B1ab(iii,v)	Yes	Yes
<i>Pararge xiphoides</i> Staudinger, 1871	LC		LC		Yes	Yes
<i>Polygonia c-album</i> (Linnaeus, 1758)	LC		LC			
<i>Polygonia egea</i> (Cramer, 1775)	LC		LC			
<i>Proterebia afer</i> (Fabricius, 1787)	LC		LC			
<i>Pseudochazara amymone</i> Brown, 1976	VU	D2	VU	D2	Yes	Yes
<i>Pseudochazara anthelea</i> (Hübner, 1824)	LC		LC			
<i>Pseudochazara cingovskii</i> (Gross, 1973)	CR	B1ab(iii,v)+ 2ab(iii,v)	NE		Yes	
<i>Pseudochazara euxina</i> (Kuznetsov, 1909)	EN	B1ab(v)	NE		Yes	
<i>Pseudochazara geyeri</i> (Herrich-Schäffer, 1846)	LC		LC			
<i>Pseudochazara graeca</i> (Staudinger, 1870)	LC		LC		Yes	
<i>Pseudochazara hippolyte</i> (Esper, 1783)	LC		LC			
<i>Pseudochazara mniszecii</i> (Herrich-Schäffer, 1851)	LC		LC			
<i>Pseudochazara orestes</i> De Prins & van der Poorten, 1981	VU	D2	VU	D2	Yes	Yes
<i>Pyronia bathseba</i> (Fabricius, 1793)	LC		LC			
<i>Pyronia cecilia</i> (Vallantin, 1894)	LC		LC			
<i>Pyronia tithonus</i> (Linnaeus, 1767)	LC		LC			
<i>Satyrus actaea</i> (Esper, 1781)	LC		LC		Yes	
<i>Satyrus ferula</i> (Fabricius, 1793)	LC		LC			
<i>Satyrus virbius</i> Herrich-Schäffer, 1844	LC		NE		Yes	
<i>Vanessa atalanta</i> (Linnaeus, 1758)	LC		LC			
<i>Vanessa cardui</i> (Linnaeus, 1758)	LC		LC			
<i>Vanessa virginiensis</i> (Drury, 1773)	NA		NA			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Vanessa vulcania</i> (Godart, 1819)	LC		LC		Yes	Yes
<i>Ypthima asterope</i> (Klug, 1832)	NA		NA			
PAPILIONIDAE						
<i>Archon apollinus</i> (Herbst, 1798)	NT	B1b(i,v)	LC			
<i>Iphiclides podalirius</i> (Linnaeus, 1758)	LC		LC			
<i>Papilio alexanor</i> Esper, 1800	LC		LC			
<i>Papilio hospiton</i> Guenée, 1839	LC		LC		Yes	Yes
<i>Papilio machaon</i> Linnaeus, 1758	LC		LC			
<i>Parnassius apollo</i> (Linnaeus, 1758)	NT	A2c	NT	A2c		
<i>Parnassius mnemosyne</i> (Linnaeus, 1758)	NT	A2c	LC			
<i>Parnassius phoebus</i> (Fabricius, 1793)	NT	A2c	NT	A2c		
<i>Zerynthia caucasica</i> (Lederer, 1864)	NA		NA			
<i>Zerynthia cerisy</i> (Godart, 1824)	NT	A2c	NT	A2c		
<i>Zerynthia cretica</i> (Rebel, 1904)	LC		LC		Yes	Yes
<i>Zerynthia polyxena</i> (Denis & Schiffermüller, 1775)	LC		LC			
<i>Zerynthia rumina</i> (Linnaeus, 1758)	LC		LC			
PIERIDAE						
<i>Anthocharis cardamines</i> (Linnaeus, 1758)	LC		LC			
<i>Anthocharis damone</i> Boisduval, 1836	LC		LC			
<i>Anthocharis euphenoides</i> Staudinger, 1869	LC		LC		Yes	
<i>Anthocharis gruneri</i> Herrich-Schäffer, 1851	LC		LC			
<i>Aporia crataegi</i> (Linnaeus, 1758)	LC		LC			
<i>Catopsilia florella</i> (Fabricius, 1775)	NA		NA			
<i>Colias alfacariensis</i> Ribbe, 1905	LC		LC			
<i>Colias aurorina</i> Herrich-Schäffer, 1850	LC		LC			
<i>Colias caucasica</i> Staudinger, 1871	LC		LC			
<i>Colias chrysotheme</i> (Esper, 1781)	VU	A2c	VU	A2c		
<i>Colias crocea</i> (Geoffroy, 1785)	LC		LC			
<i>Colias erate</i> (Esper, 1805)	LC		LC			
<i>Colias hecla</i> Lefébvre, 1836	NT	A3c	NT	A3c		
<i>Colias hyale</i> (Linnaeus, 1758)	LC		LC			
<i>Colias myrmidone</i> (Esper, 1781)	EN	A2c	CR	A2c		
<i>Colias palaeno</i> (Linnaeus, 1761)	LC		LC			
<i>Colias phicomone</i> (Esper, 1780)	NT	A2c	NT	A2c	Yes	
<i>Colias tyche</i> de Böber, 1812	LC		LC			
<i>Colotis evagore</i> (Klug, 1829)	NA		NA			
<i>Euchloe ausonia</i> (Hübner, 1804)	LC		LC			
<i>Euchloe bazae</i> (Fabiano, 1993)	VU	B2ab(v)	VU	B2ab(v)	Yes	Yes
<i>Euchloe belemia</i> (Esper, 1800)	LC		LC			
<i>Euchloe charlonia</i> (Donzel, 1842)	LC		LC			
<i>Euchloe crameri</i> Butler, 1869	LC		LC			
<i>Euchloe eversi</i> Stamm, 1963	LC		LC		Yes	Yes
<i>Euchloe grancanariensis</i> Acosta, 2008	LC		LC		Yes	Yes
<i>Euchloe hesperidum</i> Rothschild, 1913	LC		LC		Yes	Yes
<i>Euchloe insularis</i> (Staudinger, 1861)	LC		LC		Yes	Yes
<i>Euchloe penia</i> (Freyer, 1852)	LC		LC			
<i>Euchloe simplonia</i> (Freyer, 1829)	LC		LC		Yes	
<i>Euchloe tagis</i> (Hübner, 1804)	LC		LC			

Taxonomy	IUCN Red List Category (Europe)	IUCN Red List Criteria (Europe)	IUCN Red List Category (EU27)	IUCN Red List Criteria (EU27)	Endemic to Europe	Endemic to EU27
<i>Gonepteryx cleobule</i> (Hübner, 1825)	VU	B1ab(iii,v)	VU	B1ab(iii,v)	Yes	Yes
<i>Gonepteryx cleopatra</i> (Linnaeus, 1767)	LC		LC			
<i>Gonepteryx farinosa</i> (Zeller, 1847)	LC		LC			
<i>Gonepteryx maderensis</i> Felder, 1862	EN	B1ab(i,iii)	EN	B1ab(i,iii)	Yes	Yes
<i>Gonepteryx rhamni</i> (Linnaeus, 1758)	LC		LC			
<i>Leptidea duponcheli</i> (Staudinger, 1871)	LC		LC			
<i>Leptidea morsei</i> (Fenton, 1881)	NT	A2c	EN	A2c		
<i>Leptidea reali</i> Reissinger, 1989	LC		LC			
<i>Leptidea sinapis</i> (Linnaeus, 1758)	LC		LC			
<i>Pieris balcana</i> Lorković, 1968	LC		LC		Yes	
<i>Pieris brassicae</i> (Linnaeus, 1758)	LC		LC			
<i>Pieris bryoniae</i> (Hübner, 1805)	LC		LC			
<i>Pieris cheiranthi</i> (Hübner, 1808)	EN	B1ab(iii,v)+ 2ab(iii,v)	EN	B1ab(iii,v)+ 2ab(iii,v)	Yes	Yes
<i>Pieris ergane</i> (Geyer, 1828)	LC		LC			
<i>Pieris krueperi</i> Staudinger, 1860	LC		LC			
<i>Pieris manni</i> (Mayer, 1851)	LC		LC			
<i>Pieris napi</i> (Linnaeus, 1758)	LC		LC			
<i>Pieris rapae</i> (Linnaeus, 1758)	LC		LC			
<i>Pieris wollastoni</i> (Butler, 1886)	CR	B1ab(v)	CR	B1ab(v)	Yes	Yes
<i>Pontia callidice</i> (Hübner, 1800)	LC		LC			
<i>Pontia chloridice</i> (Hübner, 1813)	LC		LC			
<i>Pontia daplidice</i> (Linnaeus, 1758)	LC		LC			
<i>Pontia edusa</i> (Fabricius, 1777)	LC		LC			
<i>Zegris eupheme</i> (Esper, 1804)	NT	A3c	NT	A3c		
<i>Zegris pyrothoe</i> (Eversmann, 1832)	NA		NA			
RIODINIDAE						
<i>Hamearis lucina</i> (Linnaeus, 1758)	LC		LC			

Appendix 3. Methodology for spatial analyses

Data were analysed using a geodesic discrete global grid system, defined on an icosahedron and projected to the sphere using the inverse Icosahedral Snyder Equal Area (ISEA) Projection (S39). This corresponds to a hexagonal grid composed of individual units (cells) that retain their shape and area (~22,300 km²) throughout the globe. These are more suitable for a range of ecological applications than the most commonly used rectangular grids (S40).

The range of each species was converted to the hexagonal grid for analysis purposes. Coastal cells were clipped to

the coastline. Patterns of species richness (Fig. 5) were mapped by counting the number of species in each cell (or cell section, for species with a coastal distribution). Patterns of threatened species richness (Fig. 6) were mapped by counting the number of threatened species (categories CR, EN, VU at the European regional level) in each cell or cell section. Patterns of endemic species richness were mapped by counting the number of species in each cell (or cell section for coastal species) that were flagged as being endemic to geographic Europe as defined in this project (Fig. 7).

Appendix 4. Example species summary and distribution map

The species summary gives all the information collated (for each species) during this assessment, including a distribution map. You can search for and download all the summaries and distribution maps

from the European Red List website and data portal available online at <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>.



Erebia epistygne - (Hübner, 1819)

ANIMALIA - ARTHROPODA - INSECTA - LEPIDOPTERA - NYMPHALIDAE - Erebia - epistygne

Common Names: Spring Ringlet (English)

Synonyms: Erebia epistygne (Hübner, 1819) ;

Taxonomic Note:

Red List Assessment

Red List Status

NT - Near Threatened, (IUCN version 3.1)

Assessment Information

Evaluated?	Date of Evaluation:	Status:	Reasons for Rejection:	Improvements Needed:
True	2010-01-08	Passed	-	-

Assessor(s): van Swaay, C., Wynhoff, I., Verovnik, R., Wiemers, M., López Munguira, M., Maes, D., Sasic, M., Verstrael, T., Warren, M. & Settele, J.

Evaluator(s): Lewis, O. (Butterfly RLA) & Cuttelod, A. (IUCN Red List Unit)

Assessment Rationale

The Climatic Risk Atlas (Settele et al., 2008) calculates a possible decline of more than 98% of the climate envelope between 1980 and 2080 based on the most pessimistic of the three climate change models used (GRAS-scenario). The species might be endangered in the long term by climate change. This species is classified as Near Threatened because (i) observed rates of CO₂ emissions and temperature increases already exceed those foreseen in the worst-case scenario models, (ii) it is appropriate to take a precautionary approach and (iii) a decline in the population is already observed.

Reasons for Change

Nongenuine Change: Criteria Revision

Distribution

Geographic Range

This species occurs in Southeast France (from Languedoc to Provence and the French Alps) and Spain (in the foothills of the eastern Pyrenees and in mountainous areas in the centre, near Guadalajara, Cuenca and Teruel). In France, it occurs between 450-1,500 m elevation, in Spain 900-1,500 m. This is a European endemic species.

Biogeographic Realms

Biogeographic Realm: Palearctic

Occurrence

Countries of Occurrence

Country	Presence	Origin	Formerly Bred	Seasonality
France	Extant	Native	-	Resident
Spain	Extant	Native	-	Resident

Population

A local species, restricted to (semi-) natural areas. Declines in distribution or population size of 6-30% have been reported from France (data provided by the national partners of Butterfly Conservation Europe).

Habitats and Ecology

The Spring Ringlet appears in the early spring in grassy, rocky clearings in open woodland. The Spanish populations in the Montes Universales occur in clearings or on level ground in light pinewoods on calcareous soil, on short, grassy vegetation with low shrubs and scattered rocks. The main foodplant is Sheep's-fescue (*Festuca ovina*), but other fescues and meadow-grasses (*Poa* species) have also been named as foodplants. The Spring Ringlet has one generation a year. Habitats: alpine and subalpine grasslands (50%), dry calcareous grasslands and steppes (50%).

IUCN Habitats Classification Scheme

Habitat	Suitability	Major Importance?
Grassland -> Grassland - Temperate	Suitable	-
Rocky areas (eg. inland cliffs, mountain peaks)	Suitable	-

Systems

System: Terrestrial

Use and Trade

General Use and Trade Information

All butterflies are collected to some extent, but only for the extremely rare species it can be a problem and the trade in Europe is generally at a low level compared to other continents. There is no specific trade information for this species.

Threats

Abandonment of semi-natural grasslands is a threat to this butterfly. Furthermore in the long term climate change might have a large impact on this species.

Conservation

More research is needed on the distribution and ecology of the species. The species should be monitored by Butterfly Monitoring Schemes.

Bibliography

Arcde-Crespo, J.I. de; Jimenez-Mendoza, S. 2006. Ampliacion de la distribucion e informacion sobre patrones ecologicos de *Erebia epistygne* (Hübner, 1824) en la Serrania de Cuencia, Espana (Lepidoptera: Nymphalidae). *SHILAP - Revista de Lepidopterología* 34(133): 103-109.

Gaston, F.J.; Redondo, V.M. 2001. Actualizacion del area de vuelo de *Erebia epistygne* (Hübner, 1824); (Lepidoptera: Nymphalidae, Satyrinae). *Zapateri: revista aragonesa de entomología* 9: 121.


IUCN. 2010. IUCN Red List of Threatened Species (ver. 2010.1). Available at: www.iucnredlist.org. (Accessed: 10 March 2010).





Settele, J.; Kudrna, O.; Harpke, A.; Kühn, I.; Swaay, C. van; Verovnik, R.; Warren, M.; Wiemers, M.; Hanspach, J.; Hickler, T.; Kühn, E.; Halder, I. van; Veling, K.; Vliegenthart, A.; Wynhoff, I.; Schweiger, O. 2008. *Climatic risk atlas of European butterflies. Biorisk 1 (Special Issue)*. Pensoft, Sofia.



Erebia epistygne

range type

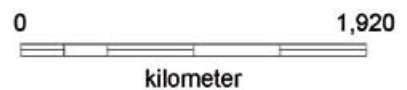
 Native (resident)

-  national boundaries
-  subnational boundaries
-  lakes, rivers, canals
-  salt pans, intermittent rivers

data source:
Butterfly Conservation Europe 2009



gall stereographic central point: 0°, 0°
map created 02/05/2010



European Commission

European Red List of Butterflies

Luxembourg: Publications Office of the European Union

2010 – x + 46pp + 4pp cover. 210 x 297 mm

ISBN 978-92-79-14151-5

doi:10.2779/83897

IUCN Red List of Threatened Species™ – Regional Assessments

The Status and Distribution of Freshwater Biodiversity in Eastern Africa. Compiled by William R.T. Darwall, Kevin G. Smith, Thomas Lowe, Jean-Christophe VieÅL, 2005

The Status and Distribution of Freshwater Fish Endemic to the Mediterranean Basin. Compiled by Kevin G. Smith and William R.T. Darwall, 2006

The Status and Distribution of Reptiles and Amphibians of the Mediterranean Basin. Compiled by Neil Cox, Janice Chanson and Simon Stuart, 2006

The Status and Distribution of European Mammals. Compiled by Helen J. Temple and Andrew Terry, 2007

Overview of the Cartilaginous Fishes (Chondrichthyans) in the Mediterranean Sea. Compiled by Rachel D. Cavanagh and Claudine Gibson, 2007

The Status and Distribution of Freshwater Biodiversity in Southern Africa. Compiled by William R.T. Darwall, Kevin G. Smith, Denis Tweddle and Paul Skelton, 2009

The Status and Distribution of Dragonflies of the Mediterranean Basin. Compiled by Elisa Riservato, Jean-Pierre Boudot, Sonia Ferreira, Miloš Jović, Vincent J. Kalkman, Wolfgang Schneider, Boudjéma Samraoui and Annabelle Cuttelod, 2009

The Status and Distribution of Mediterranean Mammals. Compiled by Helen J. Temple and Annabelle Cuttelod, 2009

European Red List of Amphibians. Compiled by Helen J. Temple and Neil Cox, 2009

European Red List of Reptiles. Compiled by Neil Cox and Helen J. Temple, 2009

European Red List of Dragonflies. Compiled by Vincent J. Kalkman, Jean-Pierre Boudot, R. Bernard, Klaus-Jürgen Conze, Geert De Knijf, Elena Dyatlova, Sonia Ferreira, Miloš Jović, Jürgen Ott, Elisa Riservato and Göran Sahlén, 2010

European Red List of Saproxyllic Beetles. Compiled by Ana Nieto and Keith N.A. Alexander, 2010

How to obtain EU publications

Free publications:

- via EU Bookshop (<http://bookshop.europa.eu>);
- at the European Commission's representations or delegations.
You can obtain their contact details by linking <http://ec.europa.eu> or by sending a fax to +352 2929-42758.

Publications for sale:

- via EU Bookshop (<http://bookshop.europa.eu>);
- Priced subscriptions (Official Journal of the EU, Legal cases of the Court of Justice as well as certain periodicals edited by the European Commission) can be ordered from one of our sales agents.
You can obtain their contact details by linking <http://bookshop.europa.eu>, or by sending a fax to +352 2929-42758.

IUCN – The Species Survival Commission

The Species Survival Commission (SSC) is the largest of IUCN's six volunteer commissions with a global membership of 8,000 experts. SSC advises IUCN and its members on the wide range of technical and scientific aspects of species conservation and is dedicated to securing a future for biodiversity. SSC has significant input into the international agreements dealing with biodiversity conservation. www.iucn.org/ssc

IUCN – Species Programme

The IUCN Species Programme supports the activities of the IUCN Species Survival Commission and individual Specialist Groups, as well as implementing global species conservation initiatives. It is an integral part of the IUCN Secretariat and is managed from IUCN's international headquarters in Gland, Switzerland. The species Programme includes a number of technical units covering Species Trade and Use, The IUCN Red List, Freshwater Biodiversity Assessment Initiative (all located in Cambridge, UK), and the Global Biodiversity Assessment Initiative (located in Washington DC, USA). www.iucn.org/species

IUCN – Regional Office for Pan-Europe

The IUCN Regional Office for Pan-Europe (ROfE) is based in Brussels, Belgium. Through its Programme Offices in Belgrade and Tbilisi and in cooperation with more than 350 European members and other parts of the IUCN constituency, the Regional Office for Pan-Europe implements the IUCN European Programme. The Programme area covers 55 countries and stretches from Greenland in the west to Kamchatka in the east. www.iucn.org/europe

The European Red List is a review of the conservation status of c. 6,000 European species (mammals, reptiles, amphibians, freshwater fishes, butterflies, dragonflies, and selected groups of beetles, molluscs, and vascular plants) according to IUCN regional Red Listing guidelines. It identifies those species that are threatened with extinction at the regional level – in order that appropriate conservation action can be taken to improve their status.

This publication summarises results for a selection of Europe's native species of butterflies. About 9% of the species are threatened with extinction at the European level as a result of threats including habitat loss and degradation due to changes in agricultural management.

The European Red List was compiled by IUCN's Species Programme and Regional Office for Pan-Europe and is the product of a service contract with the European Commission. It is available online at <http://ec.europa.eu/environment/nature/conservation/species/redlist> and <http://www.iucnredlist.org/europe>.

