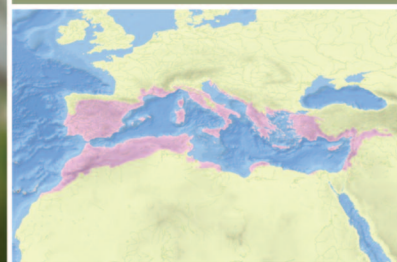


THE STATUS AND DISTRIBUTION OF MEDITERRANEAN BUTTERFLIES

Catherine Numa, Chris van Swaay, Irma Wynhoff, Martin Wiemers, Violeta Barrios, David Allen, Catherine Sayer, Miguel López Munguira, Emilio Balletto, Dubi Benyamini, Stoyan Beshkov, Simona Bonelli, Robert Caruana, Leonardo Dapporto, Filip Franeta, Patricia Garcia-Pereira, Evrim Karaçetin, Ahmad Katbeh-Bader, Dirk Maes, Nikola Micevski, Rebecca Miller, Eva Monteiro, Riadh Moulai, Ana Nieto, Lazaros Pamperis, Guy Pe'er, Andrew Power, Martina Šašić, Katy Thompson, Elli Tzirkalli, Rudi Verovnik, Martin Warren and Hilary Welch



MEDITERRANEAN



The IUCN Red List of Threatened Species™ – Regional Assessment

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Cover photo: The Bolland's Blue (*Polyommatus bollandi*) only occurs in Hatay (Turkey) and is considered Critically Endangered. It is threatened by urbanization, quarrying and overgrazing. ©Ali Atahan

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Larva of Zulloch's Blue (*Plebejus zullochi*) on its food plant *Androsace vitaliana*. © José Miguel Barea.

Foreword

The Mediterranean basin is home to many animals and plants that are found nowhere else on Earth. It is also recognized as a Global Biodiversity Hotspot, an area that besides being extremely rich in biodiversity is also under threat.

People have lived in the Mediterranean for thousands of years, and have turned it into a mosaic of natural and cultural landscapes. However, in recent decades the region has been put under tremendous pressure due to the growing human population. As a result of coastal development, the overexploitation of natural resources and changing climatic conditions, biodiversity is now highly threatened by habitat loss and degradation. Unsurprisingly, the Mediterranean basin is one of the four most significantly altered biodiversity hotspots in the world.

In a changing environment, it is critical to understand how wild plants and animals are faring, what the main threats affecting their populations are, and which conservation measures are in place, or should be implemented, to minimize their extinction risk. Assessing the conservation status of species at the Mediterranean level is particularly important to guide and inform regional policy instruments. The IUCN Red List of Threatened Species is also an important way to monitor progress towards achieving the new global Sustainable Development Goals, in particular numbers 14 and 15 which seek to halt marine and terrestrial biodiversity loss.

The Mediterranean Red List is a regional initiative focused on assessing the extinction risk of species in the Mediterranean basin. It is in the Mediterranean region that, 10 years ago, IUCN developed its first regional Red List with the support of Fondation MAVA, a successful model that was later replicated in other regions. Several groups have already been comprehensively assessed, namely mammals, reptiles, birds, freshwater fishes, cartilaginous fishes, crabs and crayfish, and dragonflies.

Butterflies are a charismatic and very visible group of species, a group of indicator species that was missing. The Status and Distribution of Mediterranean Butterflies is the latest addition to the already impressive number of species assessed at this regional level. Adding another invertebrate group also makes an important contribution towards making the Mediterranean Red List more representative of the overall Mediterranean biodiversity.

There are 463 recorded butterfly species within the Mediterranean region, of which 98 are endemic. This publication reveals that almost 5% of the species assessed are threatened with extinction, and that 79% of those threatened species are endemic. The main threat to butterflies is habitat loss due to the changes in the management of semi-natural grasslands either through intensification, overgrazing or abandonment.

However, for more than 6% of the species there was not enough available information to assess their extinction risk, and these species were classified as Data Deficient. Regional cooperation among Mediterranean countries is urgently needed in order to improve the knowledge on the status of all butterfly species, and to minimize their extinction risk throughout the Mediterranean basin.

I hope this publication will serve as a source of sound scientific data to decision-makers for policy development and management of natural resources, and that it will provide a basis for future conservation work on Mediterranean butterflies. In addition, I hope it will inspire people to learn more about, and care for, these remarkable creatures.



Jean-Christophe Vié
Deputy Director, IUCN Global Species Programme
Director, SOS - Save Our Species Partnership

Foreword

The Mediterranean is a region rich in natural and cultural heritage, characterized by high levels of species diversity and endemism. It is the second largest of the 34 biodiversity hotspots in the world. It stretches across more than 22 countries, including major terrestrial habitats such as forests, maquis, garrigue, pasture, wetlands, coastal areas and areas of transition (ecotones) between each of these and desert zones.

IUCN, as a global organisation, is the leading provider of biodiversity knowledge, tools and standards used to influence policy, undertake conservation planning and guide action on the ground. Knowledge is key and the IUCN Centre for Mediterranean Cooperation (IUCN-Med) works to leverage its knowledge, standards and tools to influence policy and to support action in the Mediterranean region, particularly those undertaken by IUCN Members. Better knowledge about biodiversity, including threats and conservation measures, will help drive action. By combining credible knowledge, standards and tools with a mobilized network of members and partners, real change in policies and action on the ground to conserve biodiversity is possible.

In that context, Regional Mediterranean Red Lists are an important tool to scientifically assess and communicate the status of species. They provide comprehensive information about the situation of biodiversity in the region and are an important practical mechanism for implementing national and regional strategies for biodiversity conservation of the Convention for Biological Diversity.

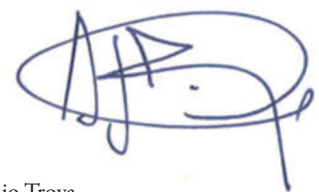
Mediterranean Red Listing contributes directly to Aichi Targets, in particular Target 12, which calls for the prevention and improvement of the conservation status of known threatened species by 2020. The assessments of the Mediterranean Red Lists are carried out in partnership with organizations and individuals around the region, and will help to deliver these various targets.

The current Mediterranean landscape and the remarkable natural richness of the hotspot is a consequence of the intense interaction that took place over millennia. Although bringing higher diversity, this modification has also placed great pressure on wildlife and natural areas. For example, more than 50% of wetlands were reported to have disappeared over the past century, and their decline and deterioration continue. Local species depletions have mostly occurred among large species, including marine mammals, birds, turtles, commercial fish and invertebrates.

Butterflies are key organisms for Mediterranean ecosystems functioning through pollination and as prey for other species. This report presents a review of the conservation status of 462 species of butterflies native to the Mediterranean biodiversity hotspot undertaken by experts from around the region. Since its establishment in 2001, the primary role of the IUCN Med has been to assess the regional conservation status of selected taxonomic groups. The Red List of Butterflies is the ninth publication in the series.

The assessment shows us that at least 19 butterfly species are threatened with extinction in the region. Unfortunately, the drivers for these declines are still in place. The conversion of grasslands into agricultural land for arable farming or forestry, unsustainable levels of grazing as well as livestock abandonment are important threats to Mediterranean butterflies.

This Red List for Mediterranean butterflies adds another piece of evidence to the fact that efforts to halt the loss of biodiversity in the region need a major boost in the coming years to safeguard our natural capital for future generations.



Antonio Troya
Director
IUCN Centre for Mediterranean Cooperation

Executive summary

Aim

The Mediterranean Red List assessment is a review of the conservation status at regional level of approximately 6,000 species (amphibians, mammals, reptiles, fishes, butterflies, dragonflies, beetles, molluscs, corals and plants) according to the IUCN Red List Categories and Criteria. It identifies those species that are threatened with extinction at the regional level to guide appropriate conservation actions for improving their status. This report summarises the results for Mediterranean butterflies.

Scope

The geographical scope is the Mediterranean region according to the Mediterranean Basin Biodiversity Hotspot (Mittermeier *et al.* 2004), with exception of the Macaronesian islands which have not been included in this study.

Conservation status assessment

The species conservation status was assessed using the IUCN Red List Categories and Criteria (IUCN 2012a). The assessments followed the guidelines for application of IUCN Red List Criteria at regional levels (IUCN 2012b). They were compiled from a

network of 35 experts from 20 countries in the region, and reviewed during a workshop in Málaga (Spain) in 2013 and through correspondence with relevant experts. All individual taxon assessments are available on the IUCN Red List website: <http://www.iucnredlist.org/initiatives/mediterranean>

Mediterranean butterflies

In the Mediterranean region 463 species of butterflies are recorded, 98 of them endemic (which means that they are unique to the Mediterranean and found nowhere else in the world). Thirty-four species occur only marginally in the region, while one species (*Cacyreus marshalli*) was introduced in the 1980s; and therefore these 35 were considered as Not Applicable in this assessment. The highest diversity of butterflies is found in mountainous areas in southern Turkey, northern Greece and southern France.

Results

Overall, about 5% (19 species) of butterflies are threatened in the Mediterranean region. Two per cent are considered Near Threatened and more than 6% are Data Deficient. This



The Balkan Clouded Yellow (*Colias caucasica*) is classified as Endangered. It is a species restricted to Greece, where strong declines are reported because of changes in the grazing regime. © Rudi Verovnik.

percentage is similar to those of Mediterranean birds and it is lower than for other groups assessed in the region such as amphibians (31%), reptiles (13%), mammals (14%) and dragonflies (19%). In the Mediterranean butterflies are slightly less threatened than in Europe (8%), probably because of the higher area of remaining natural and semi-natural habitats throughout the region.

Almost 80% of the species threatened with extinction are endemic. Most of the threatened species are confined to high elevations in southern Spain, the High and Middle Atlas in Morocco and the Anti-Taurus Mountains in southern Turkey.

The main current threat to Mediterranean butterflies is habitat loss due to the changes in the management of semi-natural grasslands either through intensification, overgrazing or abandonment. Other important threats are the intensity of tourism development in high mountains, specimen collection, domestic and agricultural pollution, climate change, transportation and service corridors, and mining.

In many Mediterranean countries there is a significant lack of information regarding distribution, population size and trends, especially in the southern and eastern part of the region.

Conclusions and recommendations

Although the percentage of threatened butterflies is lower than in other groups assessed in the region, there is an important lack

of information regarding distribution, population size and trends for several species, which could result in an increased number of threatened species.

Changes in agricultural uses due to agricultural intensification, overgrazing and abandonment are a threat to Mediterranean butterfly diversity. Further conservation actions are necessary to improve its status:

- National and international legislation should be fully implemented and revised to include the threatened species identified in this assessment.
- Prioritize field work and data collection for Data Deficient species to determine whether they need conservation actions.
- Species/habitat action plans should be drawn for the most threatened species.
- Butterfly monitoring should be started up in many more parts of the Mediterranean. Only regular counts provide data to follow populations of butterflies in detail.
- Ensure that the strong regional cooperation between experts continues, and start new cooperation efforts with experts from countries where information is scarce, so that the work carried out to produce the first evaluation of the conservation status of native Mediterranean butterflies can be updated as new information becomes available.

Chapter 1. Introduction

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In February 2013, the IUCN Centre for Mediterranean Cooperation, in collaboration with the IUCN Species Programme and Butterfly Conservation (BC), established a regional group of experts to complete an overview of the regional conservation status of butterflies in the Mediterranean region.

This report presents a summary of the overall results of the assessments for all Mediterranean butterflies, highlighting species of greatest conservation concern as well as listing those of lesser concern. It is envisaged that the information contained within this report will help facilitate the development of priority research, conservation and management actions for the region.

1.1. The Mediterranean region

The Mediterranean basin stretches approximately 3,800 km from the tip of Portugal in the west to the shores of Lebanon in the east, and approximately 1,000 km from Italy in the north to Morocco and Libya in the south. It includes 24 countries spread across three continents. Environmental conditions in the Mediterranean region have a profound influence on the vegetation and wildlife of the area. The climate is characterised by hot dry summers and humid, cool winters, and the topography is varied and contrasting. The Mediterranean region offers a changing landscape of high mountains, rocky shores, scrubland, semi-arid steppes, coastal wetlands, sandy beaches and a myriad of islands of various shapes and sizes. The landscape is a direct result of centuries of human-induced activities such as forest fires, clearances, livestock grazing and cultivation (Sundseth 2009). These conditions have a profound influence on the vegetation and wildlife of the region, which constitutes one of the world's richest places in terms of animal and plant diversity, with a high level of endemism (Myers *et al.* 2000).

Currently home to around 465 million people, the Mediterranean region is also visited by an additional 360 million tourists every year. Population growth and tourism has not only caused the loss of wildlife-rich habitats by increasing urbanization and tourism infrastructure, but has also contributed further to chronic water shortages and has also had a major socio-economic impact on large parts of the region, as many small-scale farmers have been forced to abandon their land to go and search for jobs elsewhere. The last 50 years have seen a massive change in agricultural practices across the Mediterranean. Ancient vineyards, orchards

and olive groves have been cleared to make way for industrial scale fruit or olive plantations, and mixed rotational farming has been replaced by intensive monocultures (Sundseth 2009).

Modern farming practices also put an inordinate amount of pressure on the surrounding environment through their high demand for pesticides, fertilisers and water irrigation. More than 26 million ha of farmland are now under irrigation in the Mediterranean basin and in some areas up to 80% of the available water is used for irrigation, which is leading to a severe over-exploitation of both ground and surface waters (Sundseth 2009).

Human population growth, changes in traditional land uses (e.g. agriculture intensification and agricultural abandonment), overgrazing, invasion of non-native species, fires and tourism infrastructures are some of the major threats to Mediterranean biodiversity.

1.2. Overview of the regional butterfly fauna

Butterflies are a large group of insects, belonging to the order 'Lepidoptera', which means 'scaly wing'. They are characterized by their large, often colourful 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 from the adult, with a cylindrical body, and feed mainly on plant leaves, before going through metamorphosis to form a chrysalis. The butterflies (Papilionoidea) is a superfamily of Lepidoptera forming a small fraction of Mediterranean Lepidoptera, which also includes many species of moths (Heterocera).

This report only analyses the conservation status of butterflies (Papilionoidea). 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. Butterflies are considered good indicators for the state of the environment and due to their short cycle, narrow niches and relatively low mobility, they are more sensitive to land-use changes than long-lived animals such as birds and mammals (Thomas and Clarke 2004).

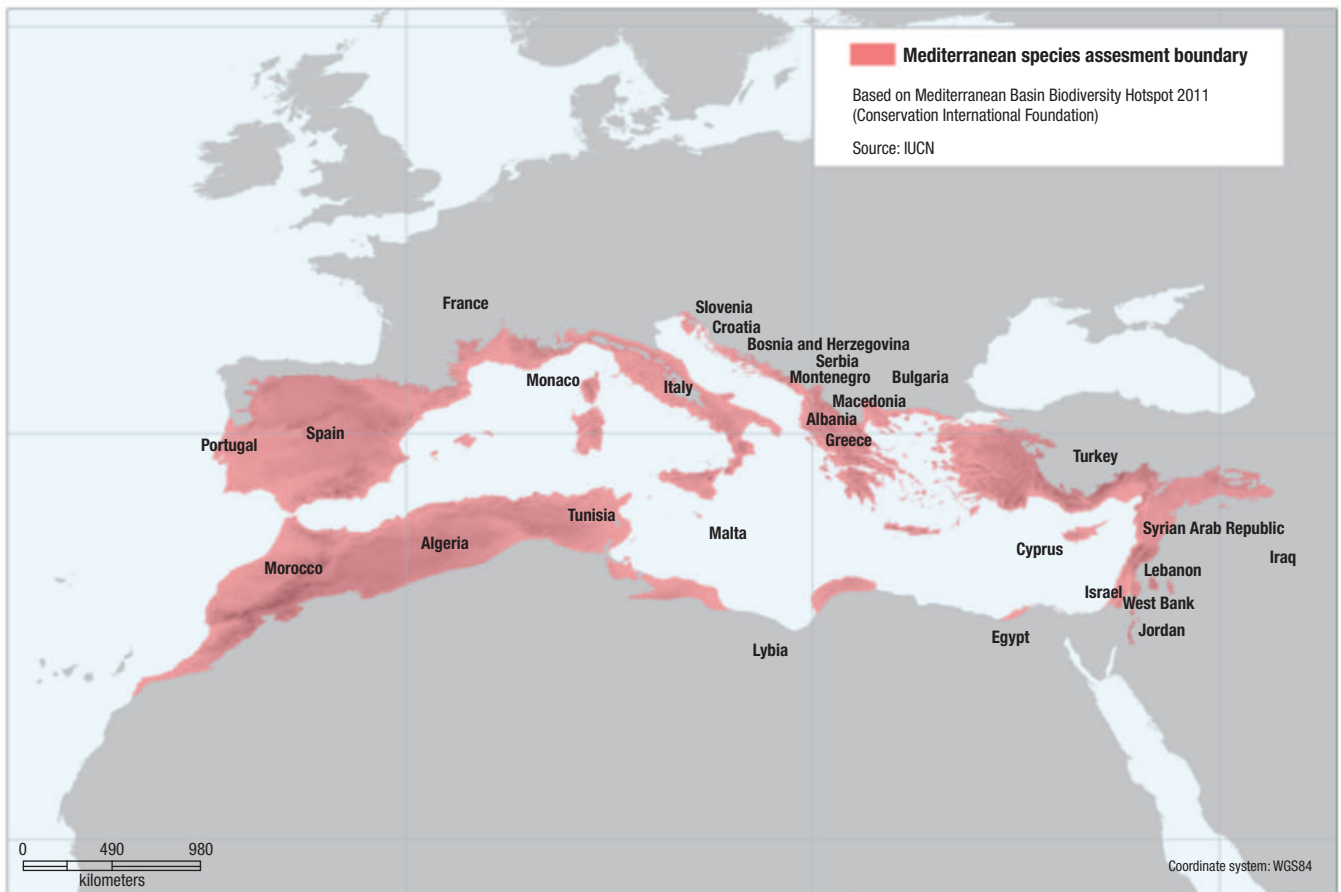


Figure 1. The Mediterranean region as defined for this project

In the Mediterranean, there are 462 native butterfly species divided into six families (Table 1). The two largest families are the Nymphalidae, with are often large and brightly-coloured species, such as the fritillaries, admirals, emperors, and tortoiseshells, also including the subfamily Satyrinae (browns); and the Lycaenidae, including the blues, the coppers and the hairstreaks, generally small brightly coloured butterflies, sometimes with a metallic gloss. The Riodinidae family, whose members are mainly

distributed in the Neotropical region, is only represented with one species: *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 and Stamer 1990), is rapidly spreading across the Mediterranean; it is not a native species and therefore is not considered in this assessment and classed as Not Applicable (NA).

Table 1. Diversity and endemism in butterfly families in the Mediterranean region*

Class	Order	Family	Number of species	Number of endemic species	% of endemic species
Insecta	Lepidoptera	Hesperiidae	52	7	13
		Lycaenidae	158	38	24
		Nymphalidae	188	44	24
		Papilionidae	14	2	14
		Pieridae	50	6	12
		Riodinidae	1	0	0
Total			463	98	21

* This table includes species that are native or were naturalised before AD 1500. Species of marginal occurrence or introduced in the Mediterranean region are also included.

More than one fifth (21%) of Mediterranean butterflies are endemic, that is, they occur only in this region. The families with the highest rates of endemism are the Nymphalidae and the Lycaenidae. The other families have a lower rate of endemism (12-14%), and the only representative of the Riodinidae is not endemic to the Mediterranean region.

1.3. Objectives of the regional assessment

The Mediterranean regional assessment has three main objectives:

- To contribute to regional conservation planning by providing a baseline dataset describing the conservation status of Mediterranean butterflies.
- To identify geographic areas which need conservation measures to prevent extinctions and ensure that Mediterranean butterflies reach and maintain a favourable conservation status.

- To develop a network of regional experts to enable species assessments to be continually updated as new information is discovered and to provide expert opinion on policy and management recommendations.

The main outputs presented in this report are:

- a comprehensive species list of all Mediterranean butterflies;
- an IUCN Red List categorization of each species;
- a summary of the main threats affecting Mediterranean butterflies;
- recommendations for the future conservation of Mediterranean butterflies and their habitats.

The data presented in this report provides a snapshot based on the knowledge available at the time of the assessment. The database will continue to be updated and made freely available. IUCN will facilitate wide dissemination of this document to concerned decision makers, scientists and non-governmental organizations to mobilize Mediterranean native butterfly conservation action at the local, national and regional levels.



The Two-tailed Pasha (*Charaxes jasius*): although widespread, this species is local and restricted to (semi-) natural areas, and populations are decreasing in the Mediterranean. © Chris van Swaay.

Chapter 2. Assessment methodology

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2.1. The IUCN Red List of Threatened Species

The IUCN Red List of Threatened Species™ (IUCN Red List) is widely recognized as the most comprehensive, scientifically-based source of information on the global conservation status of plant and animal species. IUCN Red List Categories and Criteria are applied to individual taxon assessments (which contain information on aspects such as ecology and life history, distribution, habitat, threats, current population trends and conservation measures), to determine their relative threat of extinction. Threatened species are listed as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU). Taxa that are either close to meeting the threatened thresholds, or would be

threatened were it not for ongoing conservation programmes, are classified as Near Threatened (NT). Taxa evaluated as having a relatively low risk of extinction are classified as Least Concern (LC). Also highlighted within the IUCN Red List are taxa that cannot be evaluated due to insufficient knowledge, and which have therefore been assessed as Data Deficient (DD). This category does not necessarily mean that the species is not threatened, only that its risk of extinction cannot be assessed from current data (IUCN 2009).

Additionally, when conducting regional or national assessments, the IUCN Red List Regional Guidelines (IUCN 2012b) are applied, and two additional categories are used: Regionally Extinct (RE) and Not Applicable (NA) (see Figure 2).

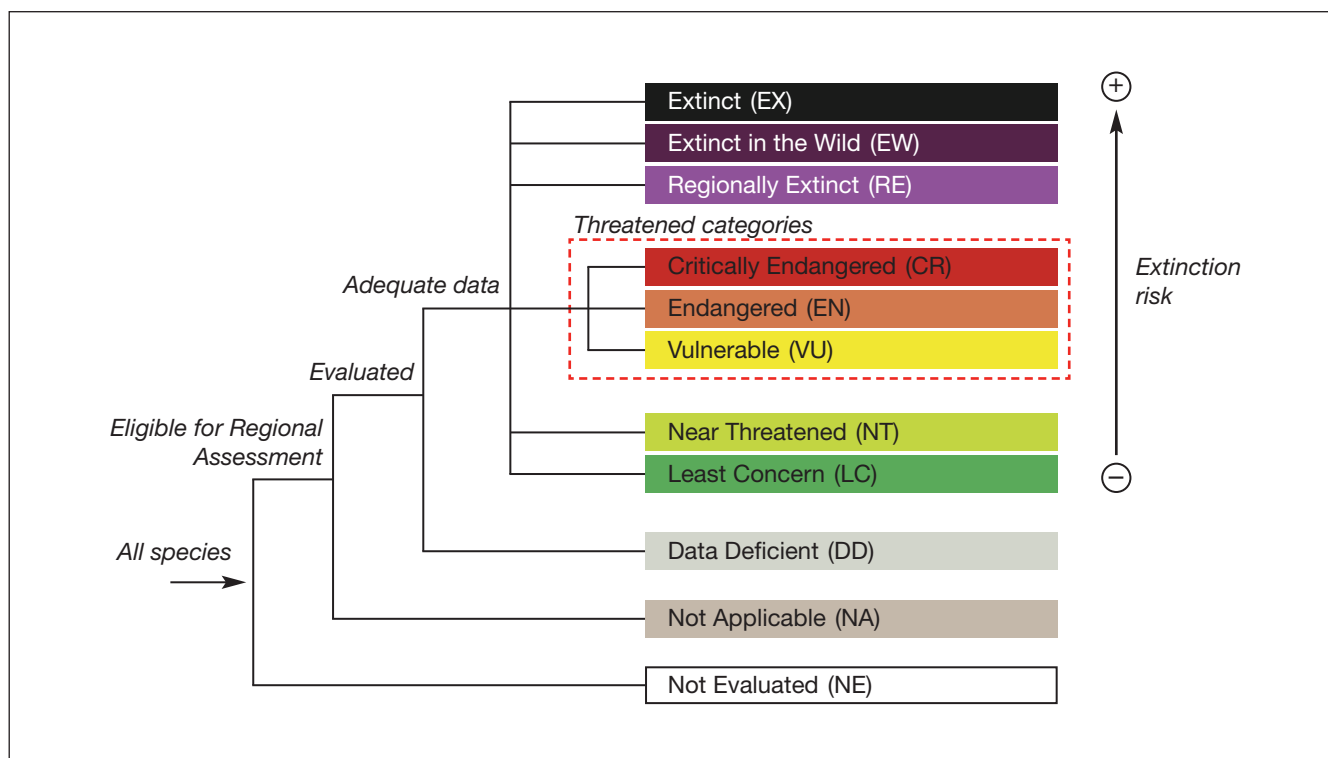


Figure 2. IUCN Red List Categories at the regional level (IUCN 2012b). For a description of each of the global IUCN Red List Categories go to: <http://www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria>.

IUCN Red List assessments can be used as a tool for measuring and monitoring changes in the status of both biodiversity and our knowledge of the individual taxa. They are an essential basis for providing targets for management priorities, and for monitoring the long term success of management and conservation initiatives.

2.2. The IUCN Red List Mediterranean initiative

The extinction risk of a species can be assessed at a global, regional or national level. A taxon can have a different category in the Global Red List and a Regional Red List. For instance, a species which is common worldwide and listed as Least Concern (LC) in the Global Red List could face a high level of threat and meet the criteria of a threatened category, for example Endangered (EN), in a particular region. 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 (IUCN 2012b) should be applied. An endemic species should have the same category at the regional and global level, as it is not present in any other part of the world.

Therefore, the present regional assessment for the Mediterranean region not only evaluates the conservation status of this taxonomic group at the regional level, but also contributes to their more comprehensive assessment at the global level as it includes regional endemics.

2.3. Geographical scope

The assessment covers the Mediterranean region as considered by the Mediterranean basin hotspot (Mittermeier *et al.* 2004) with exception of the Macaronesian islands (Figure 1).

2.4. Taxonomical scope

This regional assessment evaluates a total of 460 native Mediterranean species. A checklist of all of these regionally assessed species is provided in Appendix 1. Taxonomy followed the Fauna Europaea (Fauna-eu.org; version 2012) for all species occurring in Europe. For all other species up-to-date literature was used, mainly Tshikolovets (2011).

2.5. Data collection, assessment and review

Information on habitats and ecology, distribution, threats and conservation measures, etc. was sourced and collated for all the butterflies occurring in the Mediterranean region. Experts from across the region were identified through the network of Butterfly Conservation. All the relevant and available information on each species was input into the IUCN species database (Species Information Service-SIS). Spatial data was sourced for the production of species distribution maps using ArcView GIS software.



Expert participants at the Mediterranean Butterflies Red List workshop, February 2013, Malaga, Spain. © Lourdes Lázaro/IUCN.

The species information was then reviewed at a regional workshop where each species assessment was evaluated to ensure that the information presented was complete and correct, and that the Red List category had been applied correctly. The workshop was held in Málaga, Spain, in February 2013.

IUCN Red List assessments for 463 native species of butterflies present in the Mediterranean region were reviewed during the Málaga workshop. The status of each species was assessed according to the IUCN basic Red Listing procedures and documents, including the *Guidelines for Application of IUCN Red List Criteria at Regional Levels* (IUCN 2012b) and *IUCN Red List Categories and Criteria* (IUCN 2012a).

2.6. Assessment review process

All the Mediterranean butterfly assessments were finalised by June 2013. Experts from Mediterranean countries as well as from the IUCN Butterfly Specialist Group were then asked to review the species summary reports using a peer-review methodology. Their comments, together with any additional up-to-date information, were included in the assessments.

Supported by relevant data sources and by scientific literature, these final regional assessments are therefore the outcome of information exchange and agreement between the numerous Mediterranean specialists involved and their networks of informed colleagues.



The Provençal Fritillary (*Melitaea deione*) is a widespread species in the Mediterranean where it occurs in all types of flower-rich, grassy places.
© Chris van Swaay.

Chapter 3. Results and discussion

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3.1. Conservation status of Mediterranean butterflies

A total of 463 butterfly species in the Mediterranean region were regionally assessed. From this total, 34 species whose distributions in the Mediterranean region were less than 1% and one alien species were listed as Not Applicable and excluded from the rest of analysis. Nineteen (4.4%) of the 428 remaining species were found to be threatened with extinction (Critically Endangered, Endangered or Vulnerable) in the region. Of these, 0.5% (2 species) are listed as Critically Endangered (CR), which is the highest category of threat. A total of 3% (13 species) are listed as Endangered (EN), 0.9% (4 species) are listed as Vulnerable (VU). The status of these species must be

Table 2. Summary of the Red List status of butterflies in the Mediterranean region. Threatened categories are emphasized in colours.

IUCN Red List Categories	No. native species	No. endemic species
Extinct	0	0
Regionally Extinct (RE)	0	0
Critically Endangered (CR)	2	1
Endangered (EN)	13	10
Vulnerable (VU)	4	4
Near Threatened (NT)	9	7
Least Concern (LC)	372	56
Data Deficient (DD)	28	20
Not Applicable (NA)	35	0
Total number of species in the Mediterranean	463	98
Total number of species assessed	428	98

monitored particularly closely and, crucially, management and recovery plans should be implemented without delay. Further research and monitoring should also be conducted to better understand species' biology, threats and conservation needs. A further 2% (9 species) of these species, are listed as Near Threatened (NT), suggesting that these species need to be monitored in case their conservation status becomes more serious.

Compared to butterflies, 14% of mammals, 19% dragonflies 13% of reptiles and 31% of amphibians are threatened at the Mediterranean level (Cuttelod *et al.* 2008). No other terrestrial groups have yet been comprehensively assessed at the Mediterranean level according to IUCN regional Red List guidelines.

The extent of gaps in the knowledge of Mediterranean butterflies can be identified by the numbers and proportions of species listed as Data Deficient (DD). This category means that there are not enough data available for these species to place them in one of the other Red List categories and does not imply that these species are not threatened. Six per cent (28 species) of Mediterranean butterfly species were listed as DD. This highlights the need for continued targeted research on these species. On a more positive note, 87% (372 species) of the butterflies in the Mediterranean are listed as Least Concern (LC), meaning that there is no immediate risk of extinction, and that population trends do not trigger the criteria for any of the threatened categories (Figure 3 and Table 2).

3.2. Endemic species

There are 98 butterfly species (21%) which are endemic to the Mediterranean region. Fifteen of these species are threatened with extinction, which means that 79% of the threatened species in the Mediterranean region are endemic. One of the two species listed as Critically Endangered, the highest category of threat of extinction, is the endemic species *Polyommatus bollandi*. Ten endemic species are considered as Endangered and four species are listed as Vulnerable (Table 3). The percentage of Data

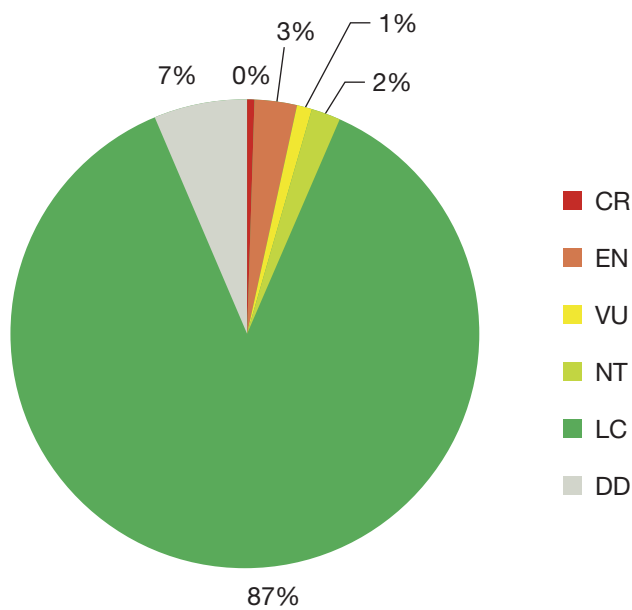


Figure 3. Red List status of butterflies in the Mediterranean region.

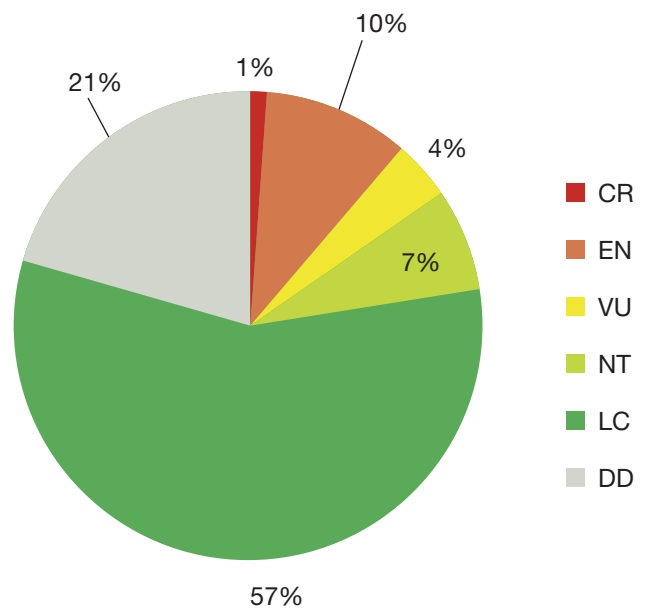


Figure 4. Red List status of Mediterranean endemic butterflies.

Table 3. Butterfly species listed as threatened at the Mediterranean regional level.

Family	Species name	Category	Endemic
Lycaenidae	<i>Polyommatus bollandi</i>	CR	endemic
Lycaenidae	<i>Polyommatus dama</i>	CR	
Hesperiidae	<i>Spialia osthelderi</i>	EN	
Lycaenidae	<i>Apharitis cilissa</i>	EN	
Lycaenidae	<i>Plebejus vogelii</i>	EN	endemic
Lycaenidae	<i>Plebejus zullichi</i>	EN	endemic
Lycaenidae	<i>Polyommatus thesiae</i>	EN	endemic
Lycaenidae	<i>Pseudophilotes fatma</i>	EN	endemic
Nymphalidae	<i>Arethusana aksouali</i>	EN	endemic
Nymphalidae	<i>Hipparchia christenseni</i>	EN	endemic
Nymphalidae	<i>Hipparchia sbordonii</i>	EN	endemic
Nymphalidae	<i>Lasiommata meadewaldoi</i>	EN	endemic
Nymphalidae	<i>Maniola halicarnassus</i>	EN	endemic
Nymphalidae	<i>Pseudochazara amydone</i>	EN	endemic
Pieridae	<i>Colias caucasica</i>	EN	
Lycaenidae	<i>Polyommatus golgus</i>	VU	endemic
Lycaenidae	<i>Polyommatus iphicarmon</i>	VU	endemic
Lycaenidae	<i>Polyommatus lycius</i>	VU	endemic
Pieridae	<i>Pieris segonzaci</i>	VU	endemic

Deficient endemic species is 20%, which is higher than the percentage of Data Deficient butterflies in general. This suggests that endemic species in the Mediterranean region are generally not very well known or studied, and generally less so than most of the more widely distributed species.

3.3. Threatened species

Nineteen species assessed in this report are threatened, belonging to one of the three IUCN threat categories (Critically Endangered, Endangered and Vulnerable) (Table 3), which represents 4.4% of the species assessed. However the proportion of threatened butterfly species is uncertain given the number of Data Deficient species, and could lie between 4.4% (if all DD species are not threatened) and 11% (if all DD species are threatened) for the Mediterranean (Table 4). Thus, the mid-point figures provide the best estimation of the proportion of threatened species (IUCN 2011), which in this case is 4.8%.

Table 4. Proportion of threatened species in the Mediterranean region.

	% threatened
Lower bound (CR + EN + VU) / (assessed – EX)	4.4
Mid-point (CR + EN + VU) / (assessed – EX – DD)	4.8
Lower bound (CR + EN + VU + DD) / (assessed – EX)	11

It should be noted that the percentages of threatened butterflies mentioned above represent minimum estimates. If we consider only those species that are surviving and for which we have enough data to assess the risk of extinction (excluding DD and NA species), we might receive a more realistic value, assuming that the percentage of threat among DD species is similar to the overall percentage of threatened species within this group. In this case, 4.8% of the assessed butterflies are threatened at Mediterranean level.

Seriously threatened species listed as Critically Endangered include the Bolland's Blue, *Polyommatus bollandi*, a species restricted to the southwestern edge of the Amanos Mountains, and the Mesopotamian Blue, *Polyommatus dama*, both endemic to Turkey. Urbanization, building of dams, roads, mining, overgrazing and pollution are the main threats to these species. Three additional species from Turkey and the Levant region are listed as Endangered: the Levantine Silver Line (*Apharitis cilisa*), the Osthelder's Skipper (*Spialia osthelderi*), and the Theresia's Blue (*Polyommatus theresiae*) are affected by habitat degradation caused by increasing irrigation, pesticide use, and urbanization. There are four more species listed as Endangered from the Balkans and Greece. The Halicarnas Brown (*Maniola halicarnasus*), the Karpathos Grayling (*Hipparchia christenseni*), the Brown's Grayling (*Pseudochazara amymone*) and the Balkan Clouded Yellow (*Colias caucasica*), all live in scattered clearings and areas with shrubby vegetation; they are affected by habitat loss and degradation caused by fires, urbanization, and infrastructure development. In Morocco, four species are also listed as Endangered: the Vogel's Blue (*Plebejus vogeli*), the Fatma's Blue



The Levantine silver-line (*Apharitis cilisa*), classified as Endangered, is threatened by agricultural intensification in southern Turkey, where irrigation and more intensive land use follows large dam schemes, allowing cultivation of new areas previously considered too dry, and resulting in the use of herbicides and pesticides. In Israel an ongoing decline in the species' distribution has been documented due to urban expansion in the coastal plains. © Ali Atahan.

(*Pseudophilotes fatma*), the Atlas Grayling (*Arethusana aksouali*) and the Moroccan Wall Brown (*Lasiommata meadewaldoi*). With only one or a few subpopulations, these species occur in high altitude mountains and are currently affected by habitat degradation, caused mainly by overgrazing. In Italy, the Ponza Grayling, *Hipparchia sbordonii*, is endemic to the Ponza islands and has a very restricted range on a few isolated islands. It is subject to strong pressures from tourism, urbanization and fires, which have led to this species being listed as Endangered. In Spain, the Zullich's Blue (*Plebejus zullichi*), listed as Endangered, is restricted to high altitudes in Sierra Nevada. Although its distribution range is included in a protected area, the species is still affected by overgrazing, trampling and infrastructures. Four butterfly species are listed as Vulnerable in the region: the Sierra Nevada Blue (*Polyommatus golgus*), an endemic from southern Spain restricted to a few mountain ranges, threatened by habitat reduction due to climate change and tourism infrastructure development; two endemics from Turkey, the Iphacarmon Blue (*Polyommatus iphacarmon*), threatened by a series of factors which include active forestry, grazing activities and conversion of mountain grasslands to agriculture, and the Lycian Blue (*Polyommatus lycius*), restricted to the Bey Mountains and threatened by pesticide use in agriculture; finally, the Moroccan Green-veined White (*Pieris segonzaci*), restricted to the High Atlas, affected by habitat degradation due to overgrazing.

3.4. Near Threatened species

Overall, nine species (2.1%) were assessed as Near Threatened (NT), reflecting concern that they are close to qualifying for a threatened category and could do so in the near future. It is essential that these species are monitored closely and, where possible, management action should be taken to avoid their becoming listed as threatened in the future. Seven of the nine species listed as Near Threatened species are endemic to the Mediterranean region. The Panoptes Blue (*Pseudophilotes panoptes*) is an Iberian endemic apparently highly susceptible to the current trends of climate change. The Atlas Blue (*Polyommatus atlanticus*) and the Vaucher's Heath (*Coenonympha vaucheri*), two species restricted to mountain ranges in Morocco and Algeria, are affected by overgrazing in their distribution range, because their host plants are preferred by domestic herbivores. The Odd-Spot Blue (*Turanana taygetica*) and the Chios Meadow Brown (*Maniola chia*), two endemics from Greece, are affected by the abandonment of traditional agriculture, quarrying and tourism, and by fires and collection respectively. In Italy, an endemic from the Aeolian Islands, the Aeolian Grayling (*Hipparchia leighebi*) lives in small areas which are exposed to fires. In Turkey, the Beautiful Blue (*Polyommatus guezelmavi*), an endemic from the Geyik Mountains, is exposed to extensive agricultural intensification and climate change. Two non-Mediterranean endemic species from Turkey and Levant are also listed as Near Threatened in the region. The Orange-banded Hairstreak (*Satyrrium ledereri*) and the Anatolian False Argus (*Aricia hyacinthus*) are affected by fire and overgrazing respectively.

3.5. Data Deficient species

This IUCN Red List assessment of all native butterflies has confirmed that there is a significant lack of information on the status of many species in the region. More than six per cent of species assessed are categorized as Data Deficient (DD). This indicates that there is insufficient information available to enable accurate assessment of their extinction risk. It is usually as a result of taxonomic uncertainty or because the species has an unknown or poorly known geographic distribution. It is important to remember that some of these DD species may be threatened by anthropogenic threats. Research efforts focusing on species for which there is currently little knowledge must therefore be urgently increased, because Data Deficient listing does not mean that these species are not threatened. In fact, as knowledge improves, such species are sometimes found to be amongst the most threatened. It is therefore essential to direct research effort and funding towards these species, as well as to those in the threatened categories. This is particularly important when there are apparent threats but no available data on population sizes or biological parameters.

3.6. Least Concern species

There are 372 butterfly species (87%) listed as Least Concern (LC) in the Mediterranean; they are not considered to be

under any known major threat of extinction now or in the foreseeable future. Many of these species are generally abundant and/or relatively widespread; have their main distribution outside intensively used agricultural areas and/or are relatively productive and resilient to other current threats and pressures. Some of these species may still benefit from conservation management action, however, even though they are listed as LC.

3.7. Non-native species

At the moment there is only one invasive butterfly species in the Mediterranean: *Cacyreus marshalli*. Since its accidental introduction to Mallorca in 1988, it has been spreading rapidly through the Western Mediterranean, later also heading east through Southern Europe. At the moment it has reached Turkey and it shows no sign of stopping, unless it gets to areas where no *Pelargoniums* are planted in urban areas (Soyhan *et al.* 2013).

3.8. Patterns of species richness

Butterfly distribution in the Mediterranean is not homogeneous. Figure 5 highlights areas of high concentrations of butterfly species diversity. The highest species richness is found in mountainous areas where high diversity of microclimates

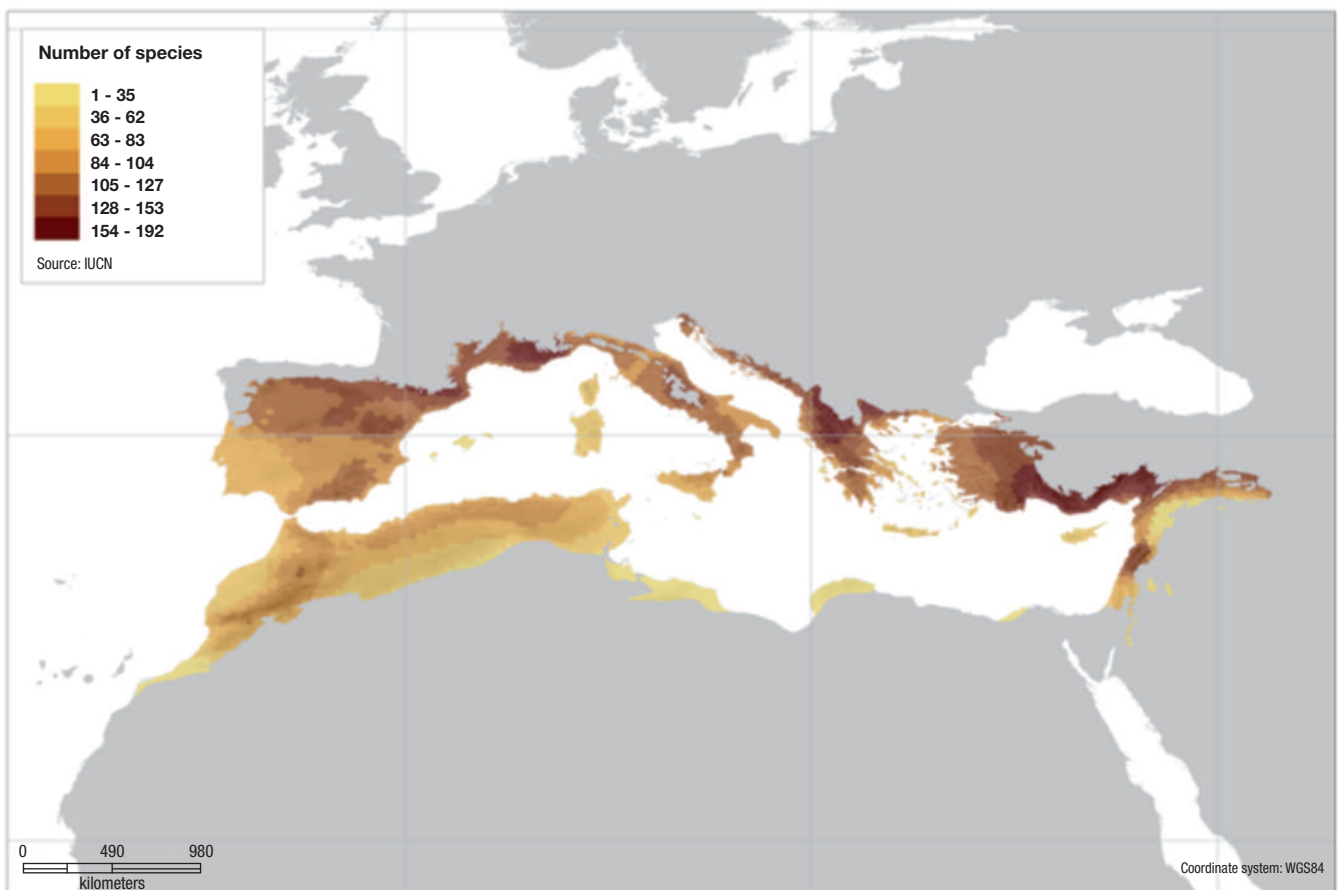


Figure 5. Species richness of butterflies in the Mediterranean region.

favours many species adapted to different microhabitats, e.g. in southern France, the higher parts of northern Greece as well as southern Turkey.

A relatively high percentage (21%) of the Mediterranean butterflies are endemic to the region. This level of endemism is higher than for example the level existing in the countries of the European Union (17%) (van Swaay *et al.* 2010). The majority of the endemic species are concentrated in the north of Africa, especially in the Rif Mountains, the High and Middle Atlas Mountains in Morocco, and the Aurès Mountains in Algeria. There are also important zones with endemism in the south-east of Spain (Sierra Nevada and Sierra of Baza), on the islands of Corsica and Sardinia, in southern Turkey and in Lebanon (Figure 6).

The proportion of threatened species in the Mediterranean is slightly lower than in the European Union (6.6%) and on the European continent (7.7%). The relatively low proportion of threatened species, when compared with the results from some other regional assessments, was thought to be due to the higher area of remaining natural and semi-natural habitats, as well as the use of traditional agriculture practices in comparison with these other regions.

There are a few areas with high concentrations of threatened species (Figure 7). These areas coincide mainly with high

elevations in south-eastern Spain, the High and Middle Atlas Mountains, northern Greece and southern Turkey in the Anti-Taurus Mountains.



The Geranium Bronze (*Cacyreus marshalli*) was introduced to the Balearic Islands in 1988 and is rapidly spreading across the Mediterranean. © Finlay Cox (Source: inaturalist.org).

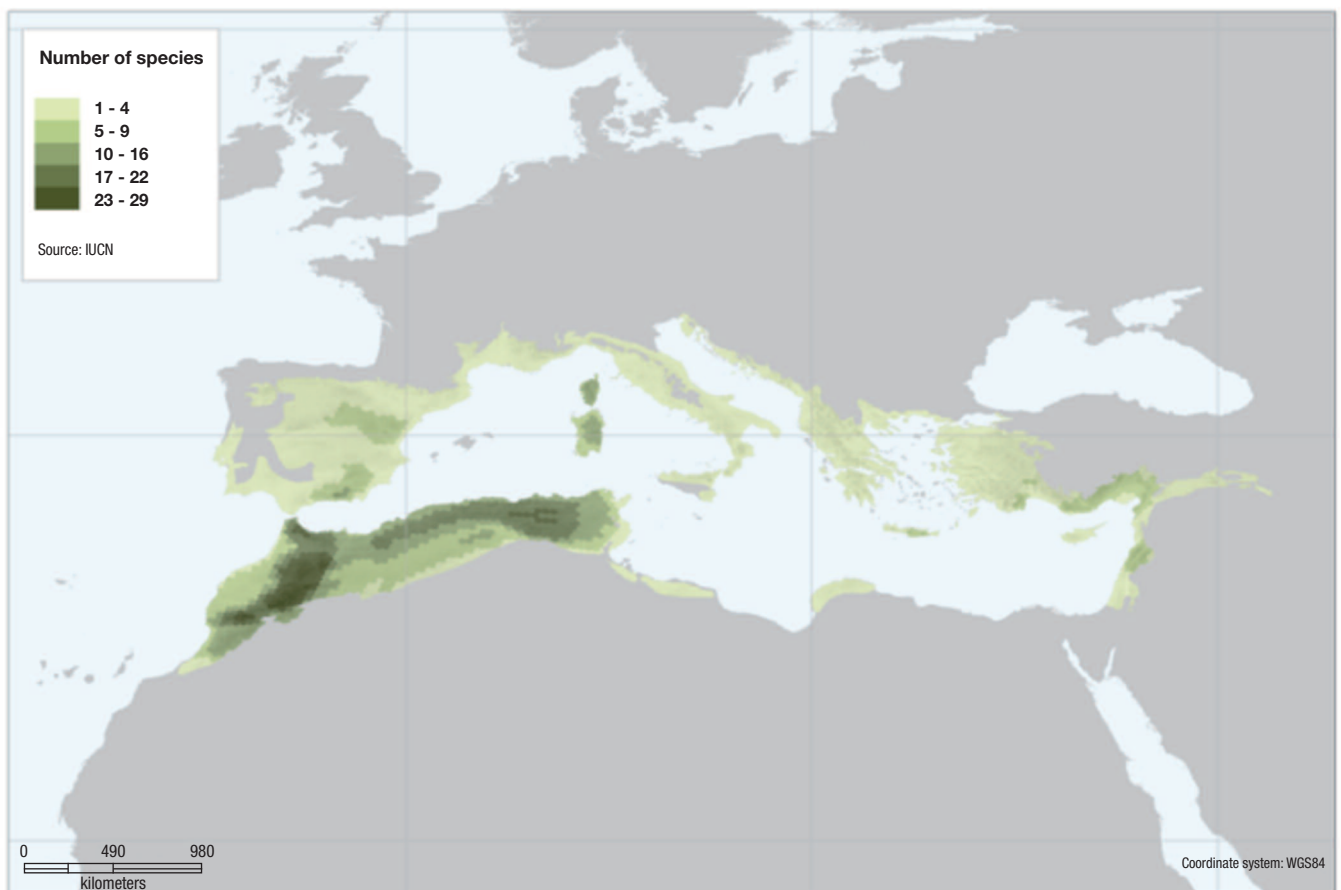


Figure 6. Species richness of endemic butterflies in the Mediterranean region.

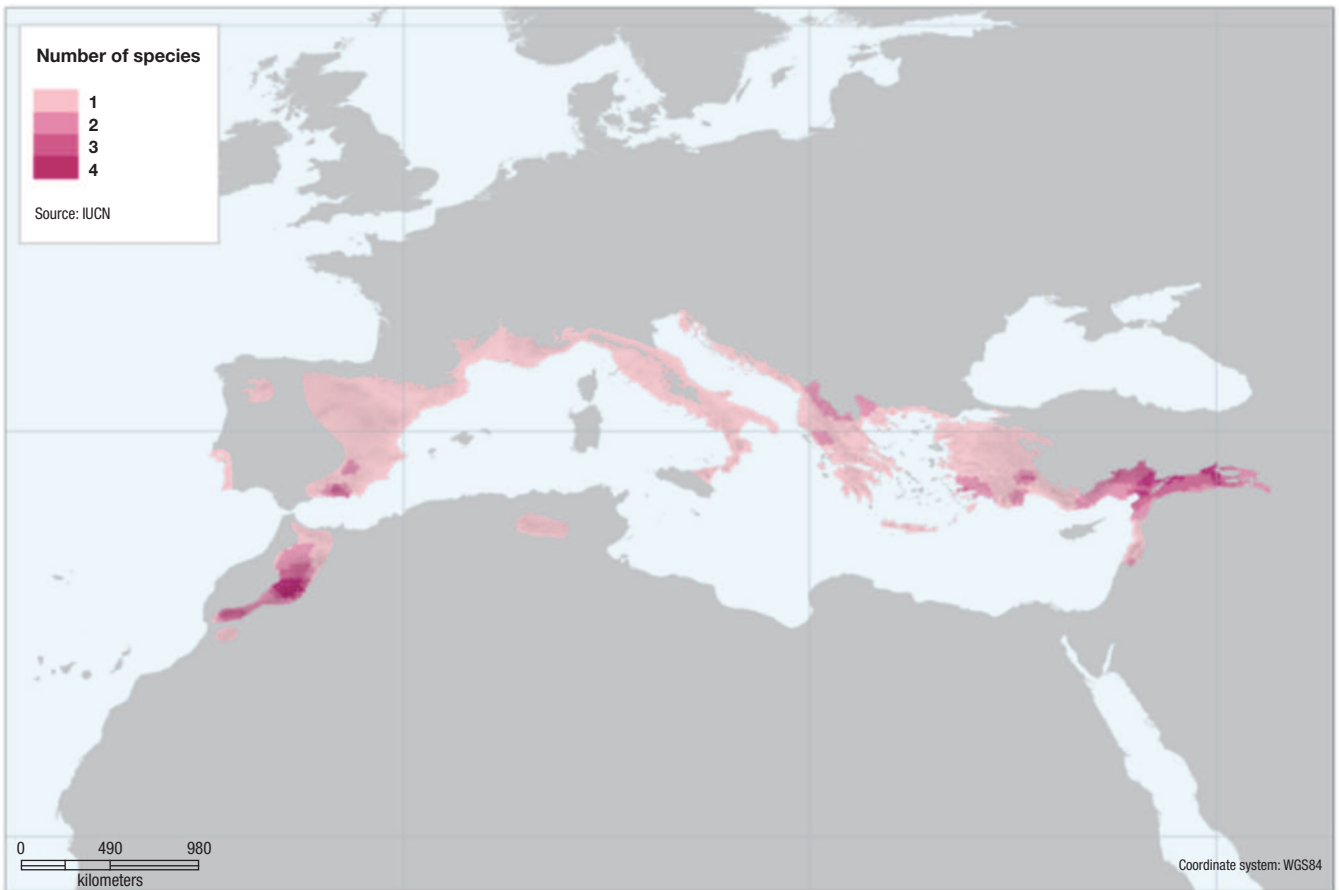


Figure 7. Distribution of threatened butterflies in the Mediterranean region.



In some regions of the Mediterranean, overgrazing is one of the main threats to butterflies, as seen here at Timahdite, in Morocco.
© Rudi Verovnik.

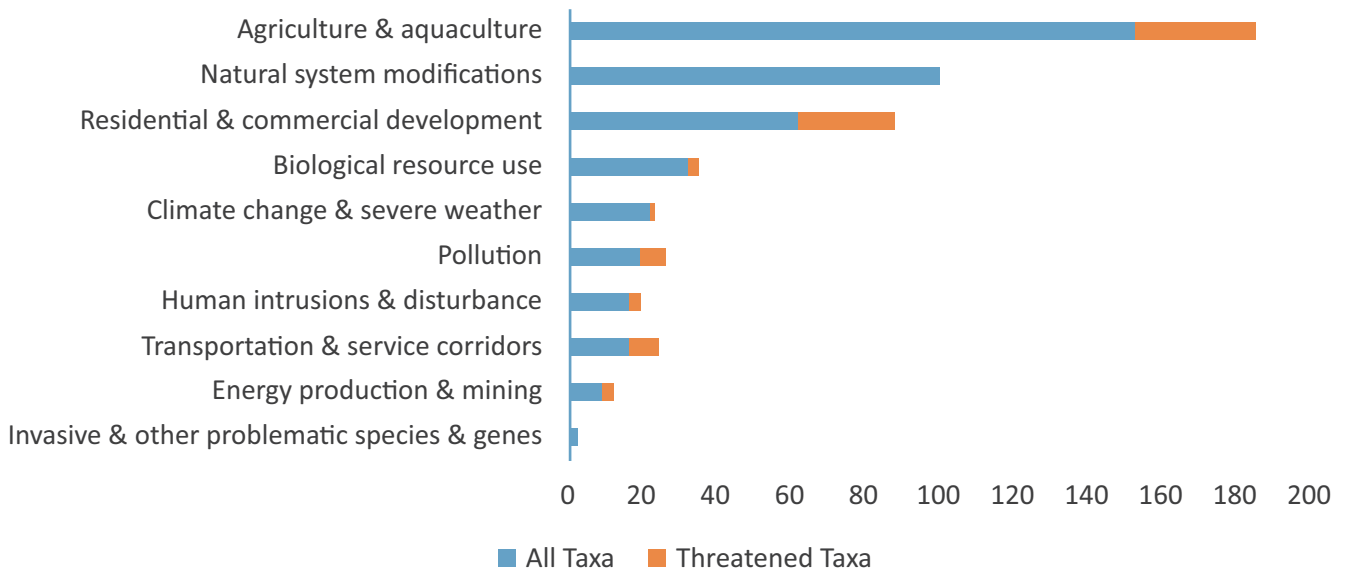


Figure 8. Summary of threats to all native species assessed in the Mediterranean region.

3.9. Major threats to butterflies in the Mediterranean region

A summary of the major threats to butterflies in the Mediterranean, according to the IUCN Classification Scheme of Threats, is presented in Figure 8. The main threat to Mediterranean butterflies is agricultural intensification, which

involves changes in the management of semi-natural grasslands and overgrazing. The conversion of grasslands into agricultural land for arable farming or forestry is a serious threat leading to habitat loss and degradation. Unsustainable levels of grazing and livestock abandonment are also important threats for Mediterranean butterflies. On one hand, overgrazing reduces the availability of nutritious plants and refuge for larvae, and on



Former grasslands, which were very rich in butterflies, get overgrown with ferns after being abandoned. Almost all species show a massive decline here. Massis del Montseny, Spain, 2015. © Chris van Swaay.

the other hand, land abandonment leads to former grassland getting overgrown with shrubs, turning later into secondary forest and thereby reducing suitable habitat for most butterfly species.

Overgrazing and agriculture intensification is reported to be one of the major threats to butterflies, especially in Morocco. Recently this has worsened and in some regions butterfly numbers have dropped to very low levels. In some parts of the Mediterranean, especially in parts of southern Europe, land abandonment is a problem, especially for butterflies relying on semi-natural grasslands (which need some form of low-intensity agricultural use).

Tourism development is an important driver of habitat loss, especially for some of the threatened species, such as *Polyommatus golgus* and *Plebejus zulichii*, in the high mountains of Sierra Nevada, in Spain, where ski development can threaten some of the populations.

Over-exploitation of larval foodplants and nectar sources, as well as deforestation, are also important threats for many species. Although collecting is a minor threat to most butterflies, a few

species are attractive to collectors. For threatened populations of these species, collecting can be an extra pressure and should therefore be avoided.

Climate change is another important threat to butterflies in the Mediterranean region. One of the possible scenarios is a northward extension of the Sahara desert, leading to arid conditions in northern Africa and possibly even in southern Europe. Climate change will also force mountain species higher up (Wilson *et al.* 2007). The pace of change will almost certainly be more rapid than most butterflies are able to migrate (see also Devictor *et al.* 2012).

Other threats have a smaller impact, but can still be important locally or for some species. Domestic and agricultural pollution can destroy small habitats and lead to faster vegetation succession, reducing the area of suitable habitat. Transportation and service corridors fragment butterfly habitats, reducing the likelihood of maintaining a viable population structure. Mining can locally destroy butterfly habitat. However, as far as we know, butterflies in the Mediterranean region are in general hardly affected by invasive species or parasites.



The Fatma's Blue (*Pseudophilotes fatma*), endemic to North Africa, is listed as Endangered due mainly to overgrazing. © Rudi Verovnik.

Chapter 4. Recommendations for priority conservation measures

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Some protection measures are currently in place, either for species or ecosystems, in the Mediterranean region. National protection status varies according to country, and there is an urgent need to implement conservation actions. The following section presents current conservation initiatives, as well as priority recommendations for the conservation of Mediterranean butterfly biodiversity.

4.1. International and regional instruments relevant to the conservation and management of Mediterranean butterflies

Mediterranean countries are signatories to a number of important conventions aimed at conserving biodiversity. The following conventions are relevant to the conservation and management of the Mediterranean insect fauna under various regional and international conventions, which are summarised in Table 5. Only one of the species listed in the appendices of international or regional conventions, *Polyommatus golgus*, is threatened in the Mediterranean region.

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 cooperation towards that objective. It covers all European countries and some African states. There are 10 Mediterranean species of butterflies listed under its Annex II (strictly protected species).

The Habitats Directive is one of the EU's two directives related to wildlife and nature conservation. There are 12 Mediterranean butterflies listed in its Annexes II (species requiring designation of Special Areas of Conservation) and IV (species in need of strict protection).

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) prevents trade in endangered

species of wild fauna and flora. Two species of butterflies, *Papilio hospiton* and *Parnassius apollo*, are listed in this convention, in Appendix II (species which may become so unless trade is closely controlled).

4.1.1. International instruments

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

CITES was established in recognition that international cooperation is essential for the protection of certain species from over-exploitation through international trade. It creates the international legal framework for the prevention of trade in endangered species of wild fauna and flora and for the effective regulation of international trade in other species which may become threatened in the absence of such regulation. CITES Appendix II lists species that are not currently endangered, but their trade must be controlled to avoid endangering the species. The Apollo butterfly (*Parnassius apollo*) and the Corsican Swallowtail (*Papilio hospiton*) are the only butterflies included in Appendix II of the CITES, which occur in the Mediterranean region.

4.1.2. Regional instruments

The Bern Convention on the Conservation of European Wildlife and Natural Habitats

The Bern Convention aims to conserve wild flora and fauna and their natural habitats, especially where the cooperation of several States is required (Council of Europe 2016). The main aim of the EC Habitats Directive is to promote the maintenance of biodiversity. The Directive requires Member States to take measures to maintain or restore natural habitats and wild species (listed in its Annexes) to a favourable conservation status, introducing robust protection for those habitats and species of European importance. This requires measures to be taken to

Table 5. Legal protection of butterflies at international and regional level in the Mediterranean

Species	IUCN Red List Category at the Mediterranean level	International Legal Instrument	Regional Legal Instrument	European Legal Instrument	
		CITES (a) Convention on International Trade in Endangered Species of Wild Fauna and Flora (1975)	Bern Convention (b) Convention on the Conservation of European Wildlife and Natural Habitats (1979)	EU Habitats Directive (c)	EU regulation on the trade in wild fauna and flora species (d)
<i>Plebicula golgus</i>	VU		II	II/IV	
<i>Apatura metis</i>	LC		II	IV	
<i>Argynnis elisa</i>	LC		II	IV	
<i>Euphydryas aurinia</i>	LC		II	II	
<i>Phengaris arion</i>	LC		II	IV	
<i>Melanargia arge</i>	LC		II	II/IV	
<i>Papilio alexanor</i>	LC		II	IV	
<i>Papilio hospiton</i>	LC	II		II/IV	A
<i>Parnassius apollo</i>	LC	II	II	IV	A
<i>Parnassius mnemosyne</i>	LC		II	IV	
<i>Pseudophilotes bavius</i>	LC			II/IV	
<i>Zerynthia polyxena</i>	LC		II	IV	

- (a) Ratified by all Mediterranean States. Appendix I lists species threatened with extinction, with trade permitted only in exceptional circumstances, Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled.
- (b) Ratified by all Mediterranean States in the study, except Algeria, Egypt, Israel, and Lebanon. Appendix II – Strictly protected fauna species. Appendix III – Protected fauna species.
- (c) Council Directive 92/43/EEC. Must be implemented in all European States of the Mediterranean, Annex II lists species requiring designation of Special Areas of Conservation; Annex IV lists species in need of strict protection.
- (d) Must be implemented in all European States of the Mediterranean according to Regulation (EC) No 338/97, Annex B.

maintain or restore to favourable conservation status in their natural range, habitats and species of wild flora and fauna of Community interest and listed in Annexes to the Directive (Council of Europe 2016).

Habitats Directive

The Habitats Directive ensures the conservation of a wide range of rare, threatened or endemic animal and plant species. Some 200 rare and characteristic habitat types are also targeted for conservation in their own right. The Habitats Directive is also known as Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora. It is a European Union directive adopted in 1992 as an EU response to the Bern Convention. It is one of the EU's two directives related to wildlife and nature conservation, the other being the Birds Directive (http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm).

EU regulation on the trade in wild fauna and flora species

CITES is implemented in the EU through a set of Regulations known as the EU Wildlife Trade Regulations. Currently these are *Council Regulation (EC) No 338/97 on the protection of species of wild fauna and flora* which deals with the protection of species of wild fauna and flora by regulating trade therein. It lays down the provisions for import, export and re-export as well as internal EU trade in specimens of species listed in its four Annexes (http://ec.europa.eu/environment/cites/legislation_en.htm).

4.2 . The butterfly monitoring network

Butterfly Monitoring involves counting butterflies following a standard protocol, often by volunteers. Since its start in 1976,

butterfly monitoring has expanded into many European countries. At present there are 22 countries where butterflies are monitored. However, most of them are not situated in the Mediterranean region, with the exception of Spain and France. Part of the Spanish network is active in Sierra Nevada, where two of the threatened butterfly species in the Mediterranean can be found (<http://www.bc-europe.eu/index.php?id=339>).

4.3. Key Biodiversity Areas for butterflies

Over the last decade, international conservation organisations have devoted much effort to locate broad scale global priorities for conservation. These include the Endemic Bird Areas (EBAs) (Stattersfield *et al.* 1998), the Global 200 Ecoregions (Olson *et al.* 2002), and the Biodiversity Hotspots (Mittermeier *et al.* 2004), amongst others. Important as they are for informing the investment of globally flexible conservation resources, these large-scale analyses do not address a practical problem. They do not exactly define which sites should be protected at a fine scale. Furthermore, by virtue of their broad scale, some sites which are globally important for biodiversity would not be captured.

Several projects have recently been developed to extend the Important Biodiversity Areas approach to other taxa. These include Important Plant Areas (IPAs), Prime Butterfly Areas, Important Mammal Areas, Prime Dragonfly Areas and Important Sites for Freshwater Biodiversity, with prototype criteria developed for freshwater fish, molluscs, odonates, and crabs. The IUCN Key Biodiversity Areas (KBAs) framework builds on these initiatives and considers all taxonomic groups for which data exist in site identification. KBAs have already been identified in many countries around the world. These can therefore be used as a starting point for national and regional level gap analyses and conservation action.

van Swaay and Warren (2003) developed the European Prime Butterfly Areas, the most important areas for butterfly conservation. However the work was restricted to Europe and a few locations in Turkey and was mainly focused on the species of the Habitats Directive, which means that it did not include all the threatened species according to the IUCN Red List. Therefore it falls short of identifying priority areas for threatened species, especially in the Mediterranean.

Doğa was one of the first organizations to apply the KBA methodology at the national level, in Turkey, in 2006. This work has resulted in a two-volume inventory of Key Biodiversity Areas of Turkey, identifying 305 KBAs, which cover 20,280,149 hectares, equivalent to 26% of Turkey's surface area. Among these sites, 292 fulfil the KBA criteria for one or more taxonomic groups on a global scale. Thirteen sites are important at a regional scale. Seventeen of Turkey's KBAs have been selected based on the conservation of butterflies. <http://www.dogadernegi.org/en/turkeys-kbas/>

A conservation strategy for butterflies has been published for Turkey, including the Mediterranean part of the country (Karaçetin *et al.* 2011).

4.4. Strategic planning for Mediterranean species conservation: action plans for butterfly species in Sierra Nevada, Spain

The Mediterranean hosts an important number of endemic butterflies. Many of these species are now restricted to small areas with low population numbers, some of them highly dependent on low-intensity farming. Climate change alone, or in combination with land abandonment will have a profound effect on these butterflies and increase their risk of extinction. A successful conservation strategy for these species requires three elements:

- (1) accurate information on the distribution and population size of these species;
- (2) a monitoring programme for species with a relict distribution or population size to identify trends more accurately;
- (3) research into the ecology and threats of the species to enable targeted conservation actions to ensure their long term survival,
- (4) commitment of the key stakeholders and the implementation of the solutions available.

These are the corner stones of a Species Recovery Program promoted by Butterfly Conservation (<http://www.bc-europe.eu/>). The first phase of this strategy focuses on the four Mediterranean endemics found in Spain (*Euchloe bazae*, *Polyommatus golgus*, *Polyommatus violetae* and *Plebejus zulichchi*). The main project outcome is an Endemic Species Recovery Programme, describing in the plans the possibilities for the long-term survival of these four threatened endemic butterflies.

4.4.1. The Zullich's Blue

The main observed threats *Plebejus zulichchi* is facing are urban development related to a ski resort and roads crossing the very limited species habitat, overgrazing, and trampling caused by livestock grazing and by tourists walking outside footpaths or roads. The small extension of the habitat of the species (61 hectares) and its fragmentation (habitat is divided into 39 patches), makes the species particularly sensitive to any threat that limits or damages the unique habitat in which it lives.

Climate change is the main threat for the species in the long term, because the climatic range of the species could be displaced toward higher areas where habitat availability is lower. A considerable percentage of the populations inhabit peaks or tops of ridges and these populations are more vulnerable to the changes caused by climate change.



The Zulich's Blue (*Plebejus zulichii*) is a small butterfly with an extremely restricted range in the high parts of Sierra Nevada. Here its main threat comes from the construction of infrastructure for ski tourism. In the long run the species might be threatened by climate change. © Jose Miguel Barea.

The species is legally protected in the Andalusia region and all its populations are within the National and Natural Parks of Sierra Nevada.

Actions for the conservation of the species include: prevent overgrazing with exclusion fences in the most vulnerable populations; avoid trampling by footpath management and information to National and Natural Park visitors; stop new developments and reduce the negative effects of the ski infrastructure and trails; reinforcement of adult and larval food plant populations to mitigate the effects of climate change; and monitor the populations of the butterfly at the larval and adult stage. Other actions comprise captive breeding of the butterfly for population reinforcement and public awareness campaigns including information materials, panels, and media releases with information about the species.

4.4.2. The Sierra Nevada Blue

The main threats detected for *Polyommatus golgus* are, in order of importance: overgrazing, trampling, low densities of its food plant, drought, and development of ski resorts and roads. The habitat of this high altitude species is not dependent on management. Light grazing does not impact upon habitat quality, but whenever grazing becomes heavier it can seriously damage the habitat of the species.

The impact of climate change on the habitat is the main problem the species is already facing. Some of the observed consequences



The Nevada Blue (*Polyommatus golgus*) is restricted to two mountain chains in southern Spain. It is threatened by tourism development and classified as Vulnerable. ©Javier Olivares.

of this change are drought, increased temperatures and the reduction of snow coverage. If these impacts continue, the range of the species would be displaced to higher areas where the habitat might not be suitable. Some populations that live in the highest areas of the mountains are already limited to very small areas with a suitable climate, and climate change would mean their extinction. For all the other populations, the impact of climate change would mean a substantial reduction of the area they occupy.

The species is protected at an international, national and regional level and all its populations live inside protected areas belonging to the European Natura 2000 Network, including one National Park, three Natural Parks and a site protected under the EC Habitats Directive.

Actions planned for the recovery of the species include: build exclusion fences in Sierra Nevada to reduce the effect of grazing upon butterfly populations; restoration of traditional footpaths and closure of shortcuts to prevent trampling; avoid new developments of tourism infrastructure in the area of the actual ski resort or in the neighbouring valleys and restoring damaged habitats; mitigate the effects of climate change through the reinforcement of adult and larval food plant populations (*Anthyllis vulneraria*); research on the genetics, population trends and the possibility of captive breeding; and raise public awareness using information leaflets and panels in the main areas where the species lives.

Chapter 5. Conclusions and Recommendations

This report presents the first comprehensive regional IUCN Red List assessment of the entire butterfly fauna of the Mediterranean region (463 species). Nineteen (4.4%) out of 428 species evaluated were considered to be threatened (0.5% being Critically Endangered, 3% Endangered, and 0.9% Vulnerable). Due to insufficient knowledge and information, 6.5% of the assessed species are listed as being Data Deficient in the Mediterranean region. Despite the current lack of data, this group may include some threatened species; increased funding and research attention needs to be directed towards these species. Although limited data availability is often cited as a problem, it should not, however, be used to justify the lack of management.

Overall changes in agricultural practices (intensification, overgrazing, as well as farming abandonment) and urban and infrastructure development are considered to be the biggest threat to butterflies in the Mediterranean region, in one way or another potentially affecting most or possibly almost all of the species present there.

Butterflies provide a wide range of environmental benefits, including pollination and natural pest control. They are an important element of the food chain and prey for birds, bats and other insectivorous animals. Even more, butterflies support a range of other predators and parasites, many of which are specific to individual species, or groups of species. Many species have developed their own suite of chemicals to deter predators and parasites, find a mate, and overcome the chemical defences

of their host plant. Each of these chemicals has a potential value and could be exploited economically. For example, powerful antibiotics have been found in the Meadow Brown (*Maniola jurtina*), one common and widespread species.

To improve the conservation status of Mediterranean butterflies urgent conservation measures are needed. In particular:

- National and international legislation should be fully implemented and revised to include the threatened species identified in this assessment.
- Prioritize field work and data collection for Data Deficient species to determine whether they need conservation actions.
- Species/habitat action plans should be drawn for the most threatened species.
- Butterfly monitoring should be started up in many more parts of the Mediterranean. Only regular counts provide data to follow populations of butterflies in detail.
- Ensure that the strong regional cooperation between experts continues, and start new cooperation efforts with experts from countries where information is scarce, so that the work carried out to produce the first evaluation of the conservation status of native Mediterranean butterflies can be updated as new information becomes available.

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Appendix 1. Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Hesperiidae	<i>Borbo borbonica</i>	LC		
Hesperiidae	<i>Carcharodus alceae</i>	LC		
Hesperiidae	<i>Carcharodus baeticus</i>	LC		
Hesperiidae	<i>Carcharodus flocciferus</i>	LC		
Hesperiidae	<i>Carcharodus lavatherae</i>	LC		
Hesperiidae	<i>Carcharodus orientalis</i>	LC		
Hesperiidae	<i>Carcharodus stauderi</i>	LC		
Hesperiidae	<i>Carcharodus tripolinus</i>	LC		endemic
Hesperiidae	<i>Carterocephalus palaemon</i>	NA		
Hesperiidae	<i>Eogenes alcides</i>	LC		
Hesperiidae	<i>Erynnis marloyi</i>	LC		
Hesperiidae	<i>Erynnis tages</i>	LC		
Hesperiidae	<i>Gegenes nostradamus</i>	LC		
Hesperiidae	<i>Gegenes pumilio</i>	LC		
Hesperiidae	<i>Hesperia comma</i>	LC		
Hesperiidae	<i>Heteropterus morpheus</i>	LC		
Hesperiidae	<i>Muschampia leuzeae</i>	DD		endemic
Hesperiidae	<i>Muschampia mohammed</i>	DD		endemic
Hesperiidae	<i>Muschampia nomas</i>	LC		
Hesperiidae	<i>Muschampia poggei</i>	LC		
Hesperiidae	<i>Muschampia proteides</i>	LC		
Hesperiidae	<i>Muschampia proto</i>	LC		
Hesperiidae	<i>Muschampia tessellum</i>	LC		
Hesperiidae	<i>Ochlodes sylvanus</i>	LC		
Hesperiidae	<i>Pelopidas thrax</i>	LC		
Hesperiidae	<i>Pyrgus aladaghensis</i>	DD		endemic
Hesperiidae	<i>Pyrgus alveus</i>	LC		
Hesperiidae	<i>Pyrgus armoricanus</i>	LC		
Hesperiidae	<i>Pyrgus bellieri</i>	LC		
Hesperiidae	<i>Pyrgus bolkariensis</i>	DD		endemic
Hesperiidae	<i>Pyrgus carlinae</i>	LC		
Hesperiidae	<i>Pyrgus carthami</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Hesperiidae	<i>Pyrgus cinarae</i>	LC		
Hesperiidae	<i>Pyrgus cirsii</i>	LC		
Hesperiidae	<i>Pyrgus malvae</i>	LC		
Hesperiidae	<i>Pyrgus malvoides</i>	LC		
Hesperiidae	<i>Pyrgus melotis</i>	LC		
Hesperiidae	<i>Pyrgus onopordi</i>	LC		
Hesperiidae	<i>Pyrgus serratulae</i>	LC		
Hesperiidae	<i>Pyrgus sidae</i>	LC		
Hesperiidae	<i>Spialia doris</i>	LC		
Hesperiidae	<i>Spialia orbifer</i>	LC		
Hesperiidae	<i>Spialia osthelderi</i>	EN	B2ab (iii)	
Hesperiidae	<i>Spialia phlomidis</i>	LC		
Hesperiidae	<i>Spialia sertorius</i>	LC		
Hesperiidae	<i>Spialia therapne</i>	LC		endemic
Hesperiidae	<i>Thymelicus acteon</i>	LC		
Hesperiidae	<i>Thymelicus hamza</i>	LC		endemic
Hesperiidae	<i>Thymelicus hyrax</i>	LC		
Hesperiidae	<i>Thymelicus lineola</i>	LC		
Hesperiidae	<i>Thymelicus novus</i>	NA		
Hesperiidae	<i>Thymelicus sylvestris</i>	LC		
Lycaenidae	<i>Apharitis acamas</i>	NA		
Lycaenidae	<i>Apharitis allardi</i>	LC		endemic
Lycaenidae	<i>Apharitis cilissa</i>	EN	B2ab (iii, v)	
Lycaenidae	<i>Apharitis maxima</i>	LC		
Lycaenidae	<i>Apharitis myrmecophila</i>	NA		
Lycaenidae	<i>Apharitis siphax</i>	LC		endemic
Lycaenidae	<i>Apharitis zobra</i>	DD		endemic
Lycaenidae	<i>Aricia agestis</i>	LC		
Lycaenidae	<i>Aricia anteros</i>	LC		
Lycaenidae	<i>Aricia artaxerxes</i>	LC		
Lycaenidae	<i>Aricia bassoni</i>	DD		endemic
Lycaenidae	<i>Aricia cramera</i>	LC		
Lycaenidae	<i>Aricia crassipuncta</i>	LC		
Lycaenidae	<i>Aricia eumedon</i>	LC		
Lycaenidae	<i>Aricia hyacinthus</i>	NT		
Lycaenidae	<i>Aricia isaurica</i>	LC		
Lycaenidae	<i>Aricia morronensis</i>	LC		
Lycaenidae	<i>Azanus jesous</i>	LC		
Lycaenidae	<i>Azanus ubaldus</i>	NA		
Lycaenidae	<i>Cacyreus marshalli</i>	NA		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Lycaenidae	<i>Callophrys avis</i>	LC		
Lycaenidae	<i>Callophrys paulae</i>	LC		
Lycaenidae	<i>Callophrys rubi</i>	LC		
Lycaenidae	<i>Celastrina argiolus</i>	LC		
Lycaenidae	<i>Chilades galba</i>	LC		
Lycaenidae	<i>Chilades trochylus</i>	LC		
Lycaenidae	<i>Cupido alcetas</i>	LC		
Lycaenidae	<i>Cupido argiades</i>	LC		
Lycaenidae	<i>Cupido decoloratus</i>	LC		
Lycaenidae	<i>Cupido lorquini</i>	LC		endemic
Lycaenidae	<i>Cupido minimus</i>	LC		
Lycaenidae	<i>Cupido osiris</i>	LC		
Lycaenidae	<i>Cyaniris semiargus</i>	LC		
Lycaenidae	<i>Deudorix livia</i>	LC		
Lycaenidae	<i>Favonius quercus</i>	LC		
Lycaenidae	<i>Glaucopsyche alexis</i>	LC		
Lycaenidae	<i>Glaucopsyche astraea</i>	LC		
Lycaenidae	<i>Glaucopsyche melanops</i>	LC		
Lycaenidae	<i>Glaucopsyche paphos</i>	LC		endemic
Lycaenidae	<i>Iolana iolas</i>	LC		
Lycaenidae	<i>Laeosopis roboris</i>	LC		
Lycaenidae	<i>Lampides boeticus</i>	LC		
Lycaenidae	<i>Leptotes pirithous</i>	LC		
Lycaenidae	<i>Lycaena alciphron</i>	LC		
Lycaenidae	<i>Lycaena asabinus</i>	LC		
Lycaenidae	<i>Lycaena bleusei</i>	LC		endemic
Lycaenidae	<i>Lycaena dispar</i>	NA		
Lycaenidae	<i>Lycaena ochimus</i>	LC		
Lycaenidae	<i>Lycaena ottomana</i>	LC		
Lycaenidae	<i>Lycaena phlaeas</i>	LC		
Lycaenidae	<i>Lycaena phoebus</i>	LC		
Lycaenidae	<i>Lycaena thersamon</i>	LC		
Lycaenidae	<i>Lycaena thetis</i>	LC		
Lycaenidae	<i>Lycaena tityrus</i>	LC		
Lycaenidae	<i>Lycaena virgaureae</i>	LC		
Lycaenidae	<i>Phengaris alcon</i>	LC		
Lycaenidae	<i>Phengaris arion</i>	LC		
Lycaenidae	<i>Phengaris nausithous</i>	NA		
Lycaenidae	<i>Phengaris teleius</i>	NA		
Lycaenidae	<i>Plebejus alcedo</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Lycaenidae	<i>Plebejus allardii</i>	LC		endemic
Lycaenidae	<i>Plebejus argus</i>	LC		
Lycaenidae	<i>Plebejus argyrognomon</i>	LC		
Lycaenidae	<i>Plebejus bellieri</i>	LC		
Lycaenidae	<i>Plebejus eurypilus</i>	LC		
Lycaenidae	<i>Plebejus hespericus</i>	LC		endemic
Lycaenidae	<i>Plebejus idas</i>	LC		
Lycaenidae	<i>Plebejus loewii</i>	LC		
Lycaenidae	<i>Plebejus martini</i>	DD		endemic
Lycaenidae	<i>Plebejus philbyi</i>	LC		
Lycaenidae	<i>Plebejus psyloritus</i>	LC		endemic
Lycaenidae	<i>Plebejus pylaon</i>	LC		
Lycaenidae	<i>Plebejus vogelii</i>	EN	B2ab (ii, iii, v)	endemic
Lycaenidae	<i>Plebejus zulichii</i>	EN	B2ac (iv)	endemic
Lycaenidae	<i>Polyommatus actis</i>	DD		
Lycaenidae	<i>Polyommatus admetus</i>	LC		
Lycaenidae	<i>Polyommatus albicans</i>	LC		
Lycaenidae	<i>Polyommatus alcestis</i>	LC		
Lycaenidae	<i>Polyommatus amandus</i>	LC		
Lycaenidae	<i>Polyommatus aroaniensis</i>	LC		endemic
Lycaenidae	<i>Polyommatus atlanticus</i>	NT		endemic
Lycaenidae	<i>Polyommatus bellargus</i>	LC		
Lycaenidae	<i>Polyommatus bollandi</i>	CR	B1ab (iii) B2ab (iii)	endemic
Lycaenidae	<i>Polyommatus caelestissimus</i>	LC		endemic
Lycaenidae	<i>Polyommatus carmon</i>	LC		
Lycaenidae	<i>Polyommatus celina</i>	LC		
Lycaenidae	<i>Polyommatus cilicius</i>	DD		endemic
Lycaenidae	<i>Polyommatus coelestinus</i>	LC		
Lycaenidae	<i>Polyommatus coridon</i>	LC		
Lycaenidae	<i>Polyommatus cornelia</i>	LC		
Lycaenidae	<i>Polyommatus dama</i>	CR	B1ab (i, ii, iii, v) + 2ab (i, ii, iii, v)	
Lycaenidae	<i>Polyommatus damon</i>	LC		
Lycaenidae	<i>Polyommatus daphnis</i>	LC		
Lycaenidae	<i>Polyommatus dolus</i>	LC		endemic
Lycaenidae	<i>Polyommatus dorylas</i>	LC		
Lycaenidae	<i>Polyommatus ellisoni</i>	DD		endemic
Lycaenidae	<i>Polyommatus eros</i>	LC		
Lycaenidae	<i>Polyommatus escheri</i>	LC		
Lycaenidae	<i>Polyommatus fabressei</i>	LC		endemic
Lycaenidae	<i>Polyommatus fulgens</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Lycaenidae	<i>Polyommatus golgus</i>	VU	D2	endemic
Lycaenidae	<i>Polyommatus guezelmavi</i>	NT		endemic
Lycaenidae	<i>Polyommatus hispanus</i>	LC		
Lycaenidae	<i>Polyommatus hopfferi</i>	LC		
Lycaenidae	<i>Polyommatus icarus</i>	LC		
Lycaenidae	<i>Polyommatus iphicarmon</i>	VU	D2	endemic
Lycaenidae	<i>Polyommatus iphigenia</i>	LC		
Lycaenidae	<i>Polyommatus isauricoides</i>	DD		endemic
Lycaenidae	<i>Polyommatus larseni</i>	DD		endemic
Lycaenidae	<i>Polyommatus lycius</i>	VU	D1	endemic
Lycaenidae	<i>Polyommatus menalcas</i>	LC		
Lycaenidae	<i>Polyommatus mithridates</i>	DD		
Lycaenidae	<i>Polyommatus myrrha</i>	LC		
Lycaenidae	<i>Polyommatus nivescens</i>	LC		
Lycaenidae	<i>Polyommatus ossmar</i>	LC		
Lycaenidae	<i>Polyommatus phyllis</i>	LC		
Lycaenidae	<i>Polyommatus poseidon</i>	LC		
Lycaenidae	<i>Polyommatus punctiferus</i>	LC		endemic
Lycaenidae	<i>Polyommatus ripartii</i>	LC		
Lycaenidae	<i>Polyommatus schuriani</i>	DD		
Lycaenidae	<i>Polyommatus sertavulensis</i>	DD		endemic
Lycaenidae	<i>Polyommatus sigberti</i>	DD		
Lycaenidae	<i>Polyommatus syriacus</i>	DD		endemic
Lycaenidae	<i>Polyommatus theresiae</i>	EN	B1ab (iii, v) B2ab (iii, v)	endemic
Lycaenidae	<i>Polyommatus thersites</i>	LC		
Lycaenidae	<i>Polyommatus violetae</i>	LC		endemic
Lycaenidae	<i>Polyommatus wagneri</i>	DD		
Lycaenidae	<i>Pseudophilotes abencerragus</i>	LC		
Lycaenidae	<i>Pseudophilotes barbaggiae</i>	DD		endemic
Lycaenidae	<i>Pseudophilotes baton</i>	LC		
Lycaenidae	<i>Pseudophilotes bavius</i>	LC		
Lycaenidae	<i>Pseudophilotes fatma</i>	EN	B2ab (iii, v)	endemic
Lycaenidae	<i>Pseudophilotes jordanicus</i>	DD		endemic
Lycaenidae	<i>Pseudophilotes panoptes</i>	NT		endemic
Lycaenidae	<i>Pseudophilotes vicrama</i>	LC		
Lycaenidae	<i>Satyrium abdominalis</i>	LC		
Lycaenidae	<i>Satyrium acaciae</i>	LC		
Lycaenidae	<i>Satyrium esculi</i>	LC		
Lycaenidae	<i>Satyrium ilicis</i>	LC		
Lycaenidae	<i>Satyrium ledereri</i>	NT		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Lycaenidae	<i>Satyrium myrtale</i>	NA		
Lycaenidae	<i>Satyrium pruni</i>	LC		
Lycaenidae	<i>Satyrium spini</i>	LC		
Lycaenidae	<i>Satyrium w-album</i>	LC		
Lycaenidae	<i>Satyrium zabni</i>	LC		
Lycaenidae	<i>Scolitantides orion</i>	LC		
Lycaenidae	<i>Tarucus balkanicus</i>	LC		
Lycaenidae	<i>Tarucus rosaceus</i>	LC		
Lycaenidae	<i>Tarucus theophrastus</i>	LC		
Lycaenidae	<i>Thecla betulae</i>	LC		
Lycaenidae	<i>Tomares ballus</i>	LC		
Lycaenidae	<i>Tomares mauretanicus</i>	LC		endemic
Lycaenidae	<i>Tomares nesimachus</i>	LC		
Lycaenidae	<i>Tomares nogelii</i>	LC		
Lycaenidae	<i>Turanana endymion</i>	LC		
Lycaenidae	<i>Turanana taygetica</i>	NT		endemic
Lycaenidae	<i>Zizeeria karsandra</i>	LC		
Lycaenidae	<i>Zizeeria knysna</i>	LC		
Nymphalidae	<i>Aglais io</i>	LC		
Nymphalidae	<i>Aglais urticae</i>	LC		
Nymphalidae	<i>Apatura ilia</i>	LC		
Nymphalidae	<i>Apatura iris</i>	LC		
Nymphalidae	<i>Apatura metis</i>	LC		
Nymphalidae	<i>Aphantopus hyperantus</i>	LC		
Nymphalidae	<i>Araschnia levana</i>	NA		
Nymphalidae	<i>Arethusana aksouali</i>	EN	A2(c) B1ab(ii, v)	endemic
Nymphalidae	<i>Arethusana arethusana</i>	LC		
Nymphalidae	<i>Argynnis adippe</i>	LC		
Nymphalidae	<i>Argynnis aglaja</i>	LC		
Nymphalidae	<i>Argynnis auresiana</i>	LC		endemic
Nymphalidae	<i>Argynnis elisa</i>	LC		endemic
Nymphalidae	<i>Argynnis niobe</i>	LC		
Nymphalidae	<i>Argynnis pandora</i>	LC		
Nymphalidae	<i>Argynnis paphia</i>	LC		
Nymphalidae	<i>Berberia abdelkader</i>	LC		
Nymphalidae	<i>Berberia lambessanus</i>	DD		endemic
Nymphalidae	<i>Boloria dia</i>	LC		
Nymphalidae	<i>Boloria euphrosyne</i>	LC		
Nymphalidae	<i>Boloria graeca</i>	LC		
Nymphalidae	<i>Boloria selene</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Nymphalidae	<i>Boloria titania</i>	NA		
Nymphalidae	<i>Brenthis daphne</i>	LC		
Nymphalidae	<i>Brenthis hecate</i>	LC		
Nymphalidae	<i>Brenthis ino</i>	LC		
Nymphalidae	<i>Brintesia circe</i>	LC		
Nymphalidae	<i>Charaxes jasius</i>	LC		
Nymphalidae	<i>Chazara bischoffii</i>	LC		
Nymphalidae	<i>Chazara briseis</i>	LC		
Nymphalidae	<i>Chazara persephone</i>	LC		
Nymphalidae	<i>Chazara priouri</i>	LC		endemic
Nymphalidae	<i>Coenonympha arcania</i>	LC		
Nymphalidae	<i>Coenonympha arcanioides</i>	LC		endemic
Nymphalidae	<i>Coenonympha corinna</i>	LC		endemic
Nymphalidae	<i>Coenonympha dorus</i>	LC		
Nymphalidae	<i>Coenonympha fettigii</i>	LC		endemic
Nymphalidae	<i>Coenonympha glycerion</i>	LC		
Nymphalidae	<i>Coenonympha leander</i>	LC		
Nymphalidae	<i>Coenonympha oedippus</i>	NA		
Nymphalidae	<i>Coenonympha orientalis</i>	LC		
Nymphalidae	<i>Coenonympha pamphilus</i>	LC		
Nymphalidae	<i>Coenonympha rhodopensis</i>	LC		
Nymphalidae	<i>Coenonympha saadi</i>	LC		
Nymphalidae	<i>Coenonympha thyrsis</i>	LC		endemic
Nymphalidae	<i>Coenonympha vaucheri</i>	NT		endemic
Nymphalidae	<i>Danaus chrysippus</i>	LC		
Nymphalidae	<i>Danaus plexippus</i>	LC		
Nymphalidae	<i>Erebia aethiops</i>	NA		
Nymphalidae	<i>Erebia cassioides</i>	LC		
Nymphalidae	<i>Erebia epiphron</i>	LC		
Nymphalidae	<i>Erebia epistygne</i>	LC		
Nymphalidae	<i>Erebia euryale</i>	LC		
Nymphalidae	<i>Erebia gorge</i>	LC		
Nymphalidae	<i>Erebia hispania</i>	LC		endemic
Nymphalidae	<i>Erebia ligea</i>	NA		
Nymphalidae	<i>Erebia medusa</i>	LC		
Nymphalidae	<i>Erebia melas</i>	LC		
Nymphalidae	<i>Erebia meolans</i>	LC		
Nymphalidae	<i>Erebia montana</i>	LC		
Nymphalidae	<i>Erebia neoridas</i>	LC		
Nymphalidae	<i>Erebia oeme</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Nymphalidae	<i>Erebia ottomana</i>	LC		
Nymphalidae	<i>Erebia rhodopensis</i>	LC		
Nymphalidae	<i>Erebia scipio</i>	LC		
Nymphalidae	<i>Erebia triaria</i>	LC		
Nymphalidae	<i>Erebia zapateri</i>	LC		endemic
Nymphalidae	<i>Euphydryas aurinia</i>	LC		
Nymphalidae	<i>Euphydryas desfontainii</i>	LC		
Nymphalidae	<i>Euphydryas maturna</i>	NA		
Nymphalidae	<i>Euphydryas orientalis</i>	DD		
Nymphalidae	<i>Hipparchia algerica</i>	LC		endemic
Nymphalidae	<i>Hipparchia aristaeus</i>	LC		endemic
Nymphalidae	<i>Hipparchia blachieri</i>	LC		endemic
Nymphalidae	<i>Hipparchia caroli</i>	LC		endemic
Nymphalidae	<i>Hipparchia christenseni</i>	EN	B2ab(v)	endemic
Nymphalidae	<i>Hipparchia cretica</i>	LC		endemic
Nymphalidae	<i>Hipparchia cypriensis</i>	LC		endemic
Nymphalidae	<i>Hipparchia ellena</i>	DD		endemic
Nymphalidae	<i>Hipparchia fagi</i>	LC		
Nymphalidae	<i>Hipparchia fatua</i>	LC		
Nymphalidae	<i>Hipparchia fidia</i>	LC		
Nymphalidae	<i>Hipparchia hansii</i>	LC		endemic
Nymphalidae	<i>Hipparchia leighebi</i>	NT		endemic
Nymphalidae	<i>Hipparchia mersina</i>	LC		endemic
Nymphalidae	<i>Hipparchia neomiris</i>	LC		endemic
Nymphalidae	<i>Hipparchia parisatis</i>	LC		
Nymphalidae	<i>Hipparchia pellucida</i>	LC		
Nymphalidae	<i>Hipparchia pisidice</i>	LC		
Nymphalidae	<i>Hipparchia powelli</i>	DD		endemic
Nymphalidae	<i>Hipparchia sbordonii</i>	EN	B1ac(iv)	endemic
Nymphalidae	<i>Hipparchia semele</i>	LC		
Nymphalidae	<i>Hipparchia senthes</i>	LC		
Nymphalidae	<i>Hipparchia statilinus</i>	LC		
Nymphalidae	<i>Hipparchia syriaca</i>	LC		
Nymphalidae	<i>Hipparchia volgensis</i>	LC		
Nymphalidae	<i>Hypolimnas misippus</i>	NA		
Nymphalidae	<i>Hyponephele kocaki</i>	DD		
Nymphalidae	<i>Hyponephele lupina</i>	LC		
Nymphalidae	<i>Hyponephele lycan</i>	LC		
Nymphalidae	<i>Hyponephele maroccana</i>	LC		endemic
Nymphalidae	<i>Hyponephele wagneri</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Nymphalidae	<i>Issoria lathonia</i>	LC		
Nymphalidae	<i>Junonia hierta</i>	NA		
Nymphalidae	<i>Junonia orithya</i>	NA		
Nymphalidae	<i>Kirinia climene</i>	LC		
Nymphalidae	<i>Kirinia roxelana</i>	LC		
Nymphalidae	<i>Lasiommata maera</i>	LC		
Nymphalidae	<i>Lasiommata meadewaldoi</i>	EN	B2ac (iv)	endemic
Nymphalidae	<i>Lasiommata megera</i>	LC		
Nymphalidae	<i>Lasiommata paramegaera</i>	LC		endemic
Nymphalidae	<i>Lasiommata petropolitana</i>	LC		
Nymphalidae	<i>Libythea celtis</i>	LC		
Nymphalidae	<i>Limenitis camilla</i>	LC		
Nymphalidae	<i>Limenitis populi</i>	LC		
Nymphalidae	<i>Limenitis reducta</i>	LC		
Nymphalidae	<i>Lopinga achine</i>	NA		
Nymphalidae	<i>Maniola chia</i>	NT		endemic
Nymphalidae	<i>Maniola cypricola</i>	LC		endemic
Nymphalidae	<i>Maniola halicarnassus</i>	EN	B1ab (iii) + 2ab (iii)	endemic
Nymphalidae	<i>Maniola jurtina</i>	LC		
Nymphalidae	<i>Maniola megala</i>	LC		endemic
Nymphalidae	<i>Maniola nurag</i>	LC		endemic
Nymphalidae	<i>Maniola telmessia</i>	LC		
Nymphalidae	<i>Melanargia arge</i>	LC		endemic
Nymphalidae	<i>Melanargia galathea</i>	LC		
Nymphalidae	<i>Melanargia grumi</i>	LC		
Nymphalidae	<i>Melanargia ines</i>	LC		
Nymphalidae	<i>Melanargia lachesis</i>	LC		
Nymphalidae	<i>Melanargia larissa</i>	LC		
Nymphalidae	<i>Melanargia lucasi</i>	LC		endemic
Nymphalidae	<i>Melanargia occitanica</i>	LC		
Nymphalidae	<i>Melanargia pherusa</i>	LC		endemic
Nymphalidae	<i>Melanargia russiae</i>	LC		
Nymphalidae	<i>Melanargia syriaca</i>	LC		
Nymphalidae	<i>Melanargia titea</i>	LC		endemic
Nymphalidae	<i>Melitaea aetherie</i>	LC		endemic
Nymphalidae	<i>Melitaea arduinna</i>	LC		
Nymphalidae	<i>Melitaea athalia</i>	LC		
Nymphalidae	<i>Melitaea aurelia</i>	NA		
Nymphalidae	<i>Melitaea britomartis</i>	NA		
Nymphalidae	<i>Melitaea cinxia</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Nymphalidae	<i>Melitaea collina</i>	LC		
Nymphalidae	<i>Melitaea deione</i>	LC		
Nymphalidae	<i>Melitaea deserticola</i>	LC		
Nymphalidae	<i>Melitaea diamina</i>	LC		
Nymphalidae	<i>Melitaea didyma</i>	LC		
Nymphalidae	<i>Melitaea ornata</i>	LC		
Nymphalidae	<i>Melitaea parthenoides</i>	LC		
Nymphalidae	<i>Melitaea perseia</i>	LC		
Nymphalidae	<i>Melitaea phoebe</i>	LC		
Nymphalidae	<i>Melitaea punica</i>	LC		endemic
Nymphalidae	<i>Melitaea trivialis</i>	LC		
Nymphalidae	<i>Minois dryas</i>	NA		
Nymphalidae	<i>Neptis rivularis</i>	NA		
Nymphalidae	<i>Neptis sappho</i>	NA		
Nymphalidae	<i>Nymphalis antiopa</i>	LC		
Nymphalidae	<i>Nymphalis polychloros</i>	LC		
Nymphalidae	<i>Nymphalis xanthomelas</i>	NA		
Nymphalidae	<i>Pararge aegeria</i>	LC		
Nymphalidae	<i>Polygonia c-album</i>	LC		
Nymphalidae	<i>Polygonia egea</i>	LC		
Nymphalidae	<i>Proterebia phegea</i>	LC		
Nymphalidae	<i>Pseudochazara anymone</i>	EN	B2ab (ii, iii, iv)	endemic
Nymphalidae	<i>Pseudochazara anthelea</i>	LC		
Nymphalidae	<i>Pseudochazara atlantis</i>	LC		endemic
Nymphalidae	<i>Pseudochazara beroe</i>	LC		
Nymphalidae	<i>Pseudochazara geyeri</i>	NA		
Nymphalidae	<i>Pseudochazara graeca</i>	LC		endemic
Nymphalidae	<i>Pseudochazara mamurra</i>	LC		
Nymphalidae	<i>Pseudochazara mniszecii</i>	LC		
Nymphalidae	<i>Pseudochazara orestes</i>	NA		
Nymphalidae	<i>Pseudochazara pelopea</i>	LC		
Nymphalidae	<i>Pseudochazara thelephassa</i>	LC		
Nymphalidae	<i>Pseudochazara williamsi</i>	LC		endemic
Nymphalidae	<i>Pyronia bathseba</i>	LC		
Nymphalidae	<i>Pyronia cecilia</i>	LC		
Nymphalidae	<i>Pyronia janiroides</i>	DD		endemic
Nymphalidae	<i>Pyronia tithonus</i>	LC		
Nymphalidae	<i>Satyrus actaea</i>	LC		
Nymphalidae	<i>Satyrus amasinus</i>	LC		
Nymphalidae	<i>Satyrus favonius</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Nymphalidae	<i>Satyrus ferula</i>	LC		
Nymphalidae	<i>Thaleropsis ionia</i>	LC		
Nymphalidae	<i>Vanessa atalanta</i>	LC		
Nymphalidae	<i>Vanessa cardui</i>	LC		
Nymphalidae	<i>Vanessa virginiensis</i>	LC		
Nymphalidae	<i>Ypthima asterope</i>	LC		
Papilionidae	<i>Archon apollinus</i>	LC		
Papilionidae	<i>Iphiclides podalirius</i>	LC		
Papilionidae	<i>Papilio alexanor</i>	LC		
Papilionidae	<i>Papilio demoleus</i>	NA		
Papilionidae	<i>Papilio hospiton</i>	LC		endemic
Papilionidae	<i>Papilio machaon</i>	LC		
Papilionidae	<i>Parnassius apollo</i>	LC		
Papilionidae	<i>Parnassius mnemosyne</i>	LC		
Papilionidae	<i>Zerynthia cassandra</i>	LC		
Papilionidae	<i>Zerynthia cerisyi</i>	LC		
Papilionidae	<i>Zerynthia cretica</i>	LC		endemic
Papilionidae	<i>Zerynthia deyrollei</i>	LC		
Papilionidae	<i>Zerynthia polyxena</i>	LC		
Papilionidae	<i>Zerynthia rumina</i>	LC		
Pieridae	<i>Belenois aurora</i>	NA		
Pieridae	<i>Anthocharis belia</i>	LC		endemic
Pieridae	<i>Anthocharis cardamines</i>	LC		
Pieridae	<i>Anthocharis damone</i>	LC		
Pieridae	<i>Anthocharis euphenoides</i>	LC		
Pieridae	<i>Anthocharis gruneri</i>	LC		
Pieridae	<i>Aporia crataegi</i>	LC		
Pieridae	<i>Catopsilia florella</i>	NA		
Pieridae	<i>Colias alfacariensis</i>	LC		
Pieridae	<i>Colias aurorina</i>	LC		
Pieridae	<i>Colias caucasica</i>	EN	B12ab (iii, iv)	
Pieridae	<i>Colias chlorocoma</i>	DD		
Pieridae	<i>Colias crocea</i>	LC		
Pieridae	<i>Colias erate</i>	LC		
Pieridae	<i>Colias hyale</i>	NA		
Pieridae	<i>Colotis chrysonome</i>	NA		
Pieridae	<i>Colotis evagore</i>	LC		
Pieridae	<i>Colotis fausta</i>	LC		
Pieridae	<i>Colotis phisadia</i>	NA		
Pieridae	<i>Euchloe ausonia</i>	LC		

Appendix 1. cont'd, Summary of regional IUCN Red List status of all Mediterranean butterfly species assessed

Family	Species	IUCN Red List Category at the Mediterranean level	IUCN RL Criteria	Mediterranean endemic
Pieridae	<i>Euchloe bazae</i>	LC		endemic
Pieridae	<i>Euchloe belemia</i>	LC		
Pieridae	<i>Euchloe charlonia</i>	LC		
Pieridae	<i>Euchloe crameri</i>	LC		
Pieridae	<i>Euchloe falloui</i>	LC		
Pieridae	<i>Euchloe insularis</i>	LC		endemic
Pieridae	<i>Euchloe pechi</i>	DD		endemic
Pieridae	<i>Euchloe penia</i>	LC		
Pieridae	<i>Euchloe tagis</i>	LC		
Pieridae	<i>Gonepteryx cleopatra</i>	LC		
Pieridae	<i>Gonepteryx farinosa</i>	LC		
Pieridae	<i>Gonepteryx rhamni</i>	LC		
Pieridae	<i>Leptidea duponcheli</i>	LC		
Pieridae	<i>Leptidea juvernica</i>	LC		
Pieridae	<i>Leptidea reali</i>	LC		endemic
Pieridae	<i>Leptidea sinapis</i>	LC		
Pieridae	<i>Pieris brassicae</i>	LC		
Pieridae	<i>Pieris bryoniae</i>	NA		
Pieridae	<i>Pieris ergane</i>	LC		
Pieridae	<i>Pieris krueperi</i>	LC		
Pieridae	<i>Pieris mannii</i>	LC		
Pieridae	<i>Pieris napi</i>	LC		
Pieridae	<i>Pieris rapae</i>	LC		
Pieridae	<i>Pieris segonzaci</i>	VU	B2b(iii, v) c(iv)	endemic
Pieridae	<i>Pontia callidice</i>	LC		
Pieridae	<i>Pontia chloridice</i>	LC		
Pieridae	<i>Pontia daplidice</i>	LC		
Pieridae	<i>Pontia edusa</i>	LC		
Pieridae	<i>Pontia glauconome</i>	LC		
Pieridae	<i>Zegris eupheme</i>	LC		
Riodinidae	<i>Hamearis lucina</i>	LC		



THE IUCN RED LIST
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