Assessing Butterflies in Europe -

Executive Summary

Butterfly

CONSERVATION EUROPE

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Executive Summary

1. The Assessing Butterflies in Europe (ABLE) project was an EU Parliamentary Pilot project with a duration of two years (beginning of December 2019 to the end of November 2020) and received €800,000 of funding via a service contract with Directorate General Environment.

2. The mandate and rationale from the EU Parliament was:

   "The project aims at developing a suite of EU Lepidoptera indicators which can help improve conservation measure and assess progress in implementing EU policies and legislation such as the EU Biodiversity Strategy to 2020 and the EU Habitats Directive. Besides providing a highly relevant indicator for measuring progress in terms of managing and restoring Natura 2000 sites, it would also contribute to monitoring progress on Target 3 of the EU Biodiversity Strategy, which aims to increase the contribution of agriculture and forestry to maintaining and enhancing biodiversity. In particular, the pilot should deliver a representative indicator to help monitor the impact of the Common Agricultural Policy on grassland biodiversity. It will also provide data to produce a climate change indicator, thereby contributing to the ongoing revision of climate change adaptation strategies. Indicators will also be possible for woodland, wetland and urban habitats."

3. The ABLE project was delivered by a consortium of the UK Centre for Ecology & Hydrology, Butterfly Conservation Europe, Butterfly Conservation UK, De Vlinderstichting and Helmholtz-Zentrum für Umweltforschung GmbH – UFZ. Considerable in-kind contributions were provided by Butterfly Conservation partners across Europe.

4. There is mounting evidence of widespread declines in the diversity and abundance of insects across the globe. The ABLE project is particularly timely in helping to develop capacity for monitoring of insects and assessing the status of butterflies in the EU.

5. There are 482 butterfly species in Europe (451 occurring within the EU27), breeding in a wide range of habitats. Butterflies react quickly to change and are considered to be good biological indicators, especially of other insects and pollinators. Monitoring butterflies can help shed light on changes in these important groups.

6. The main aims of the ABLE project were to collate butterfly monitoring data across Europe, to facilitate the start of new schemes in the EU, and to develop indicators to help policy design and evaluation.

7. Following the mandate from the EU Parliament for this Pilot project, we make the following key recommendations:

   i. Use Butterfly Monitoring Scheme (eBMS) data and indicators for EU policy design; to inform resource planning, especially for Member State's Prioritised Action Frameworks (PAFs); and to track, evaluate and adjust EU and MSs policy implementation, including the EU Green Deal, EU Biodiversity Strategy 2030 and the EU Farm to Fork Strategy, to help reverse pollinator declines.
   ii. Use Member State and Article 17 data on butterflies to inform the design, implementation and evaluation of the EU CAP and MS's CAP Strategic Plans; to ensure Forestry plans include more grassland refuges and herb rich rides and edges; and that urban planning and regional developments invest in pollinator habitats.

iii. Use available Butterfly Monitoring Scheme data to strengthen the quality of assessments of conservation Status of Habitats Directive listed habitats and species in meeting mandatory reporting requirements under Art 17 of the Directive

iv. Invest in linking butterfly data with land use and management data, including implementation of Natura 2000 Management Plans, Land Parcel Information system and Satellite data to help evaluate conservation effectiveness

v. Support additional monitoring of rare and vulnerable butterflies (including endemics and those not listed on the Habitats Directive) and designate some additional Protected Areas to sustain and enhance the quality of remaining areas that are important for these Red Listed butterflies and so prevent further extinctions

vi. Invest in further capacity building and cooperation among citizen scientists, professionals, farmers and authorities to monitor and record abundance of butterflies, moths and other pollinators, including supporting coordination, training and growth of citizen science eBMS schemes (as recommended by EU Pollinator Expert Group); filling data gaps and developing tools and expertise to gather and integrate data from various sources.

vii. ABLE shows that Citizen Science eBMS are cost effective, delivering very good value for money. New citizen science Butterfly Monitoring Schemes are needed in Denmark, Greece, Latvia, Romania and Slovakia. Together with further support to sustain and increase transects across most EU MSs, especially in the ten schemes newly created during the ABLE project.

The ten EU27 countries where new Citizen Science butterfly monitoring schemes were begun in 2019/2020, with the support of ABLE, BCE partners and active volunteers, are Austria, Bulgaria, Croatia, Cyprus, Czech Republic, Hungary, Italy, Malta, Poland and Portugal. Together with Belgium, Estonia, Finland, France, Germany, Ireland, Luxemburg, Lithuania (currently dormant), Netherlands, Slovenia, Spain, Sweden, there are now 22 EU(27) Member States with butterfly monitoring schemes. With several more outside the EU, including Norway, Switzerland and the UK (which has the longest running scheme).

8. This Executive Summary accompanies detailed technical reports on the three project tasks: development of butterfly indicators, development of butterfly monitoring networks, and tools to support butterfly monitoring and analysis. High level summaries from these three project tasks are given below.

The spectacular upperside of* Phengaris teleius *is not often displayed. This species is listed on the Habitats Directive.

Development of Butterfly Indicators

1. A new approach for assessing butterfly trends and developing indicators of European butterflies was developed by the ABLE project.

2. This analysis approach was used to update the European Grassland Butterfly indicator and to present new butterfly indicators for widespread species, woodland butterflies as well as butterflies in urban environments, in Natura 2000 areas and as climate change indicators. The indicators presented are based on data, available for years up to 2018, from 22 national Butterfly Monitoring Schemes from across Europe, most of them members of the European Union.

3. All indicators are constrained by available data. For most of the butterfly species in Europe, particularly rare species, there are not yet enough data to calculate trends. Indicators therefore mainly reflect the status of widespread species for which we do have data (35% of all butterflies in Europe). At the level of individual monitoring schemes within Member States, there is often spatial bias in location of monitoring sites; recent schemes tend to under-represent agroecosystems and over-represent protected areas for example. Given the constraints of existing Butterfly Monitoring data for the EU, the trends we find are highly likely to underestimate the declines in butterflies overall and particularly trends for rare and threatened species and for those species dependent on agroecosystems. This is due to a deficiency in data for both rare species and farmland transects. We recommend investment in filling these data gaps urgently. This requires support from EU Member States to build on the ABLE project, extending volunteer butterfly monitoring schemes and to invest in the planned implementation of the overarching Pollinator Monitoring Framework implementation.

4. Furthermore, it is important to recognise that, where monitoring data exists, there were serious declines in insect abundance before 1990. It is likely that trends we report using available monitoring data are from a low base across the EU. Article 17 Reports from Member States, under the EU Habitats Directive show that most butterflies of European importance are in unfavourable conservation status; as are the grassland habitats many of them depend on. As this project shows, it is vital that more butterfly monitoring takes place across Europe to add to knowledge about what is happening to invertebrates across all EU Biogeographic zones. This is required to improve understanding of the impacts of policies and the effectiveness of biodiversity conservation and recovery actions, planned under the EU Biodiversity Strategy 2030 and the reformed CAP.

5. Our analysis,incorporating new data from additional areas shows that in 2018, the indicator for the common and widespread species was stable with respect to 1990 levels, both in Europe and in the EU27 (Figure 1). Butterfly numbers generally declined over the period 1990 to 2016, followed by a recovery in 2017 and 2018.

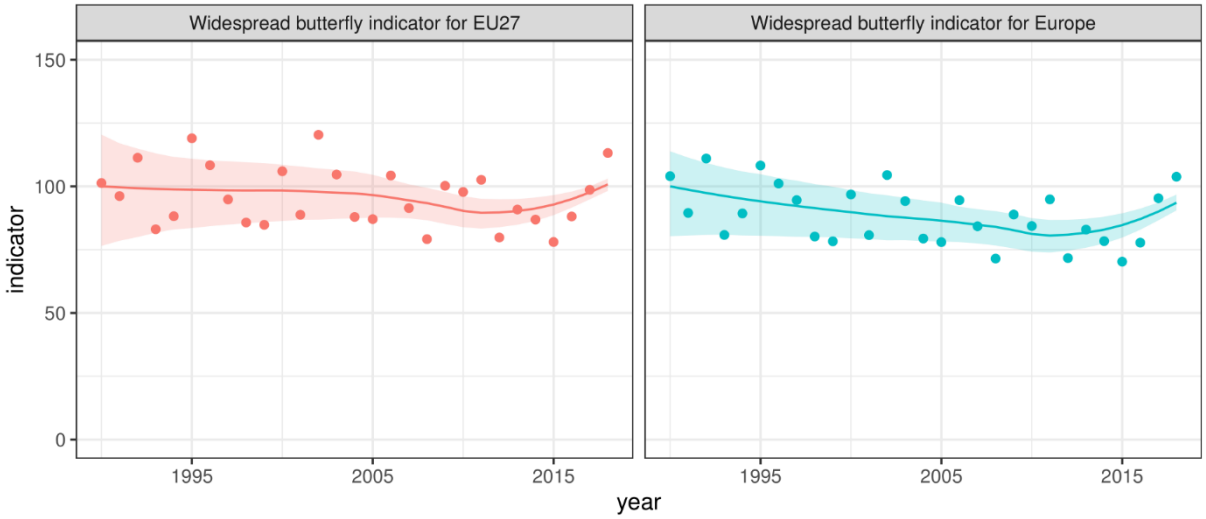

Figure 1. Widespread butterfly indicators for EU27 and Europe. Beware that rare and threatened (and often declining) species could not be included because of insufficient data, meaning the indicator for all butterflies might be more negative. Shaded areas represent 95% confidence intervals.


A male Orange Tip (Anthocharis cardamines), a butterfly species showing a moderate increase in the EU27.

6. The indicators for widespread butterflies per biogeographical region (BGR) in the EU27 show that in the Atlantic region butterflies have declined substantially, but the trend is stable in the other three BGRs for which enough data were available (Figure 2). It is likely that there are at least two underlying drivers here. Climate warming over the last decade has probably led to more reproductive success in some butterfly populations and some shifts in their range. On the other hand the serious losses of habitat extent, quality and connectivity in many agricultural areas will have adversely affected butterfly abundance and population resilience. Abandonment of semi natural grassland is also recognised in research as an important driver of declines, particularly in Eastern Europe. Adding new butterfly monitoring schemes in Greece and Romania, which still have high biodiversity, is especially important. It is also essential to strengthen newly developed eBMS schemes and increase volunteers and data recorded and analysed.

Figure 2. Widespread butterfly indicators per biogeographical region for EU27. Shaded areas represent 95% confidence intervals. Note that rare and threatened species are under-represented due to lack of data.

7. The Grassland Butterfly indicator has declined by 22% since 1990 across pan-Europe (Figure 3). Across the 17 Member States with schemes in the EU27 the indicator value is 25% lower in 2018 compared to 1990. However, there is greater uncertainty in the year estimates for the EU27 indicator due to less data being included than for Europe as a whole. Grassland butterflies in the Atlantic biogeographical zone have shown declines over the period 1990 to 2018, mainly due to the intensification and loss of semi natural grassland in these regions.

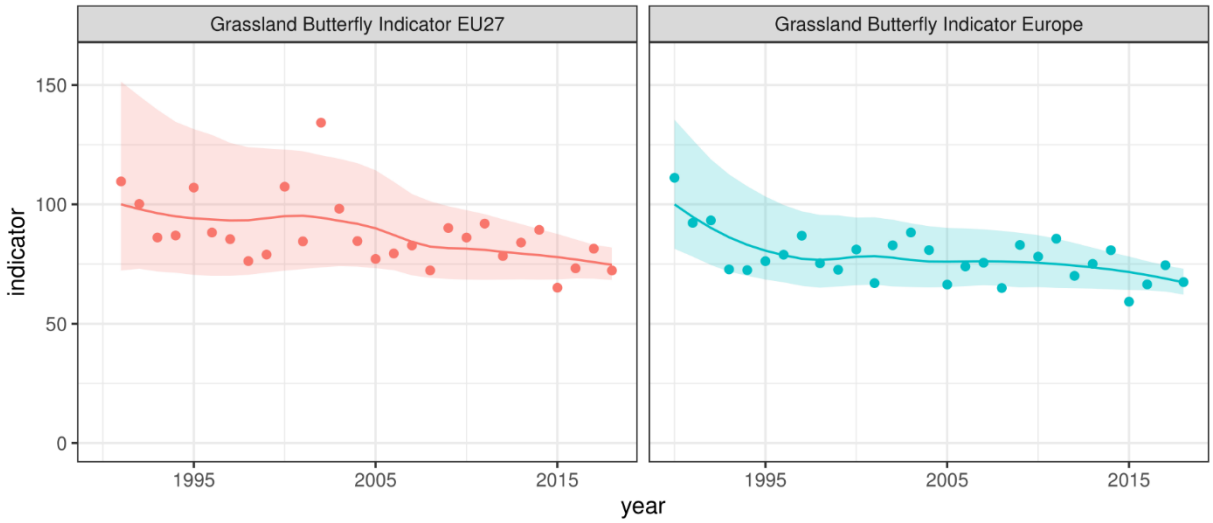

Figure 3: Grassland butterfly indicators for EU27 and Europe. Shaded areas represent 95% confidence intervals.

8. The Woodland Butterfly indicator is stable over the last 30 years, with a decline in the 1990s and an increase in the last ten years, both in Europe and the EU27 (Figure 4). The recent increase might indicate that the area and quality of woodland for butterflies is increasing, probably as a result of the increase in forest area as a result of agricultural land abandonment combined with the effects of climate change, which makes the habitat more suitable for several species. In Sweden the woodlands are cut more often and as a result there are more butterfly-friendly grasslands available within them providing nectar and other resources, also used by woodland butterflies.

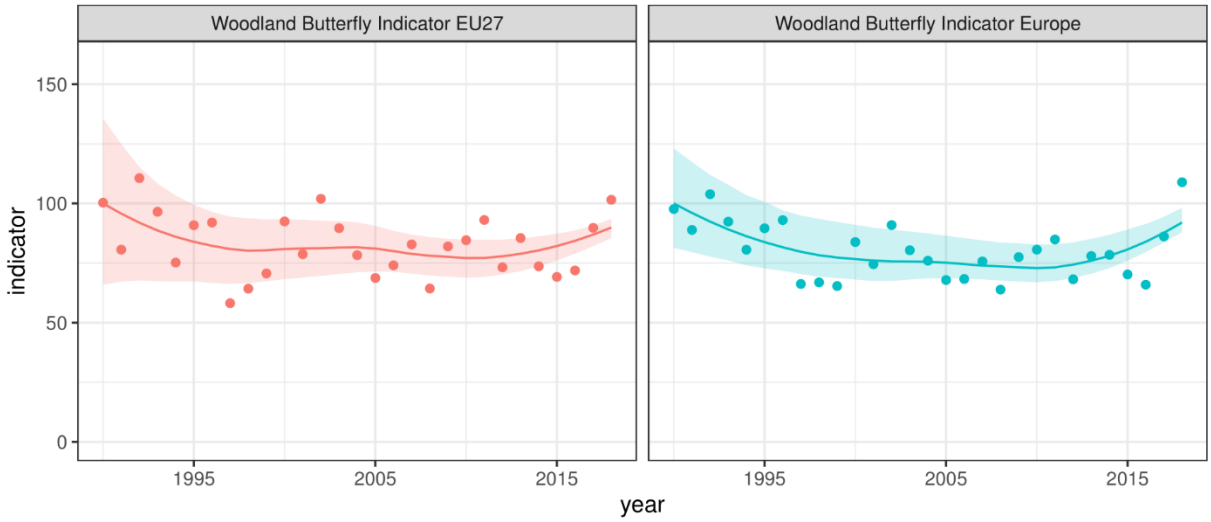

Figure 4: Woodland butterfly indicators for EU27 and Europe. Shaded areas represent 95% confidence intervals.

9. The Butterfly Climate Change Indicator does not provide a clear message, with an increase in the EU27 and a decline in Europe (and mainly in the United Kingdom). This indicator might be less suitable for future use. Almost all butterflies occurring on wetland are rare and threatened, with many wetlands are very hard to access for transect counts. As a result there was not enough data from wetland butterflies, making it not yet possible to calculate an indicator for this habitat.

10. Rare and threatened species were severely under-represented, resulting in indicators which are mainly based on widespread species, classified in the EU Butterfly Red List 2010 as "Least concern". In the near future there should be extra focus on these rare and threatened species, although counting butterflies in remote areas can be a challenge. At this point help from natural and national parks and other nature reserves could make a difference in future and could be benefit from specific action. We expect rarer species to be better represented in future

indicators as newly developed Butterfly Monitoring Schemes, including those initiatied and supported through ABLE, build up monitoring time series.

11. Common and widespread butterflies seem to fare better in urban areas than outside. This could be due to data deficiencies, or may be because there is more attention to butterfly-friendly management in urban areas than outside, where intensive agriculture often dominates the landscape. The indicator for the widespread species inside and outside Natura 2000 areas shows a stable trend for both areas.

Development of Butterfly Monitoring Scheme networks

1. Prior to ABLE, several countries contributed butterfly monitoring data to the European Butterfly Monitoring Scheme (eBMS), but they were concentrated in Central and Western Europe. Large parts of South and Eastern Europe had no regular scheme. Three groups were prioritised for action: six to eight EU countries which had a good probability of establishing a scheme; recently started schemes that required further support; and countries where longer term activities were needed to develop monitoring.

2. As a result of the two-year ABLE project, sixteen new national and regional partners have joined the eBMS data network (Figure 5). Ten EU countries have started new Butterfly Monitoring Schemes (Italy, Portugal, Hungary, Austria, Cyprus in 2019 and Poland, Bulgaria, Czech Republic, Malta and Croatia in 2020). Further support is required to nurture the growth and sustainability of these schemes. The following EU countries require a new volunteer-based Butterfly Monitoring Scheme, as a vital element of a European Pollinator Monitoring Scheme: Denmark, Greece, Latvia, Romania and Slovakia.

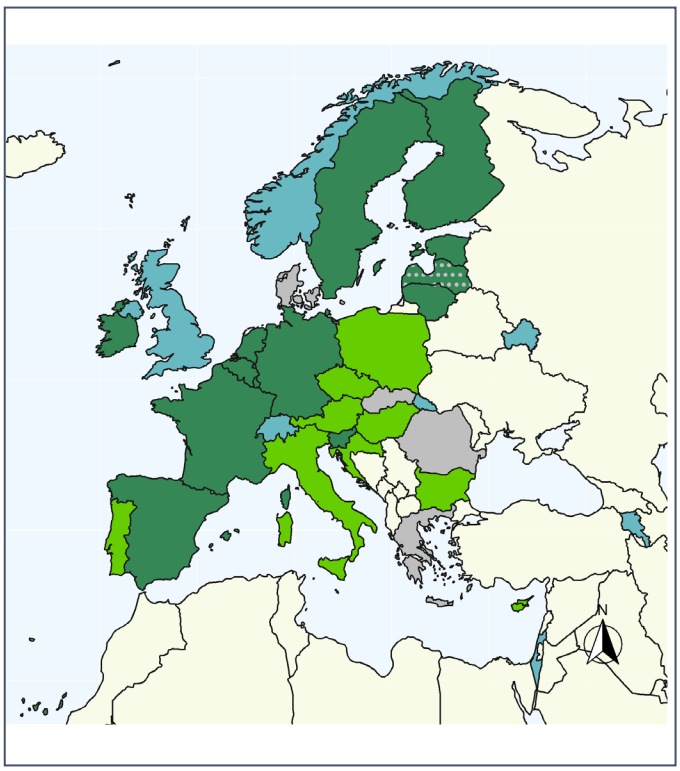

Figure 5. Map of Butterfly Monitoring schemes in the EU27 and non-EU countries with transects in 2020.

Key:

Dark green: EU27 countries with BMS data;

Light green EU27 countries with BMS established through support of ABLE in 2019 and 2020;

Grey: EU27 countries requiring a citizen science BMS;

Blue: Non-EU countries with transect data.

3. A suite of support materials has been produced, including a Butterfly Transect Manual, which has been translated into six languages and a series of regional butterfly identification guides (Figure 6). Videos have been made explaining how to count butterflies on a transect and PowerPoint presentations have been made available in several languages.

(a)

(b)

Figure 6. (a) Front cover of the Butterfly Transect Count Manual. (b) Example Field Guide pages created by the ABLE project. From left to right: Andalusia (Spain), Mediterranean islands and Apennines (Italy).

4. More than 20 workshops and training seminars were held in ten different countries involving more than 600 people. During the Covid pandemic, these were held online. Butterfly monitoring was promoted via social media as well as by articles in magazines and through EU level meetings.. The eBMS website was used to host all materials and reports. A meeting was held of all coordinators in late 2019, attended by 59 people from 29 countries. A technical workshop was held online in March 2020, attended by 35 people with a final meeting in October 2020.

5. Lessons learnt include the value of sharing knowledge from established schemes, ensuring broad involvement of citizens/stakeholders, and promoting the value of a Europe-wide scheme.

6. The eBMS provides an invaluable resource to inform EU policy development and evaluate the effectiveness of measures such as the CAP, Habitats Directive, Natura 2000, and the new Pollinator Action Plan. However, continuing financial support is needed from each Member State to develop capacity in existing schemes and start new schemes in countries which do not have one. This will help make a more complete scheme that accurately represents changes across Europe.

Tools to support Butterfly Monitoring and Analysis

1. Butterfly Monitoring Scheme data was collated for 25 schemes across 22 countries of Europe, comprising nearly 14 million counts spanning a 52-year period (1976-2018). Butterflies have been monitored from almost 11,000 separate sampling locations (transects) and, although still highly concentrated in North and Western Europe (Figure 7), the spatial coverage of butterfly monitoring is increasing.

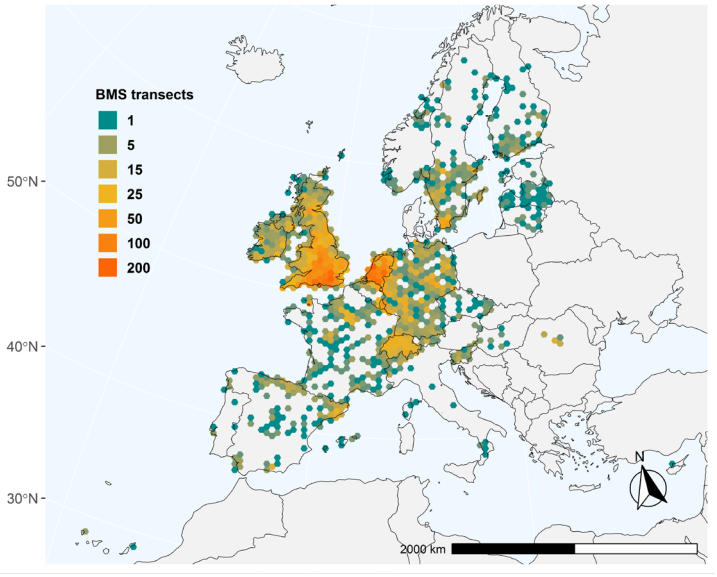

Figure 7. The density of Butterfly Monitoring transects visited per 50km grid across all schemes that have contributed to the eBMS database. Densities are calculated from sites that have been visited at least once since 2000.

2. A website to support Butterfly Monitoring was developed during the ABLE project (https://butterfly-monitoring.net/) and provides a focus for supporting the development of new Butterfly Monitoring Schemes, e.g. is the primary data capture system for Spain, Luxembourg, Italy, Portugal and Austria BMS. The website will help to support the continued growth of butterfly monitoring across the EU (Figure 8).

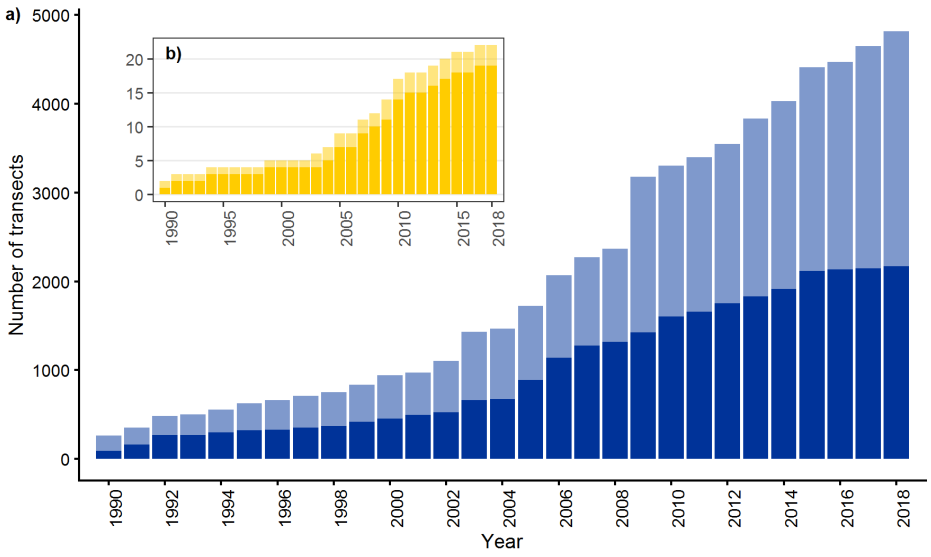

Figure 8. a) Number of Butterfly Monitoring transects that contributed to the European Butterfly Indicator (1990-2018), where schemes within EU27 are represented in dark blue and non-EU schemes in light blue. b) Number of regional and national Butterfly Monitoring Schemes contributing.

3. Tools for analysis and visualisation of Butterfly Monitoring count data were developed as an R library (**rbms** package) to facilitate researchers and national co-ordinators to compute standardised and robust abundance indices and trends from butterfly counts.

To help monitor rare butterflies and those that occur in remote areas, a new ButterflyCount app was developed, based on standard 15-min counts. The app has an identification guide and lists of butterflies customised to each country to facilitate recording. This data will be assimilated into the eBMS to help extend coverage and make a more representative scheme. The ButterflyCount app was tested across Europe (Figure 9) in 2019 and 2020.

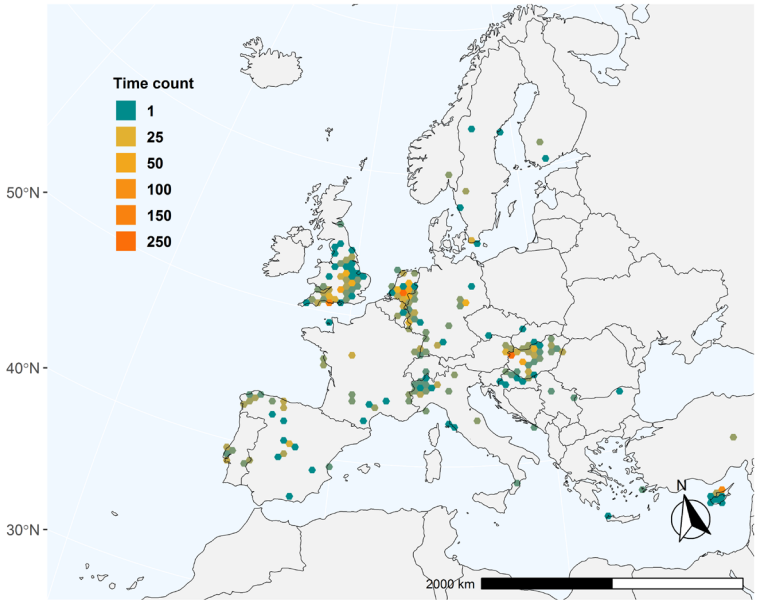

Figure 9. The number of timed counts (15 minutes) recorded per 50 km via the ButterflyCount mobile application

Conclusions: Butterfly Indicators can support the transition to a healthier environment

The EU State of Nature Report shows that biodiversity and ecosystem health are in a poor state, and at risk of further declines. Research shows that insects and the habitats they depend on are declining and under pressure. Pollination services are also at risk. Citizens across Europe have been studying and systematically monitoring butterflies in the field for many years. The eBMS database brings together this data and produces indicators that are an invaluable resource for research and policy evaluation. Butterflies are charismatic insects and a good proxy for the state of insect biodiversity.

Recognition of the importance of eBMS data is growing. The ABLE project, supported by €800,000 of funding, voted by the EU Parliament, has demonstrated effective measures to initiate and sustain butterfly monitoring; has enhanced the quantity and quality of data availble; improved analysis techniques and developed a suite of policy relevant Indicators. The ABLE project has enabled BC Europe and its partners to recruit and train coordinators and volunteers; to provide support via materials and tools (such as the innovative ButterflyCount App); calculate Indicators; and raise the profile of the value and usefulness of butterfly monitoring. The project has helped establish Butterfly Monitoring Schemes in ten additional EU Member States (MSs), bringing the total of EU eBMS to 22 EU Member States. These schemes supply quality data and, by using trained citizen scientists, are cost effective and offer excellent value for money.

Information about the project and the value of using butterfly data and indicators has been disseminated widely. The Butterfly Grassland Indicator is included in the EU SEBI 2010 and the more recent EU Sustainable Development Goals Indicator set. They have relevance also to sectoral and national policy develoipment, implementation and evaluation.

Further developments and funding are now required to sustain schemes, especially the ten schemes newly created in ABLE. Action is also needed to fill data gaps, develop additional tools for analysis and data integration and ensure existing data is used in policy evaluation at EU and Member State levels.