

Summary of tools and data products produced under ABLE

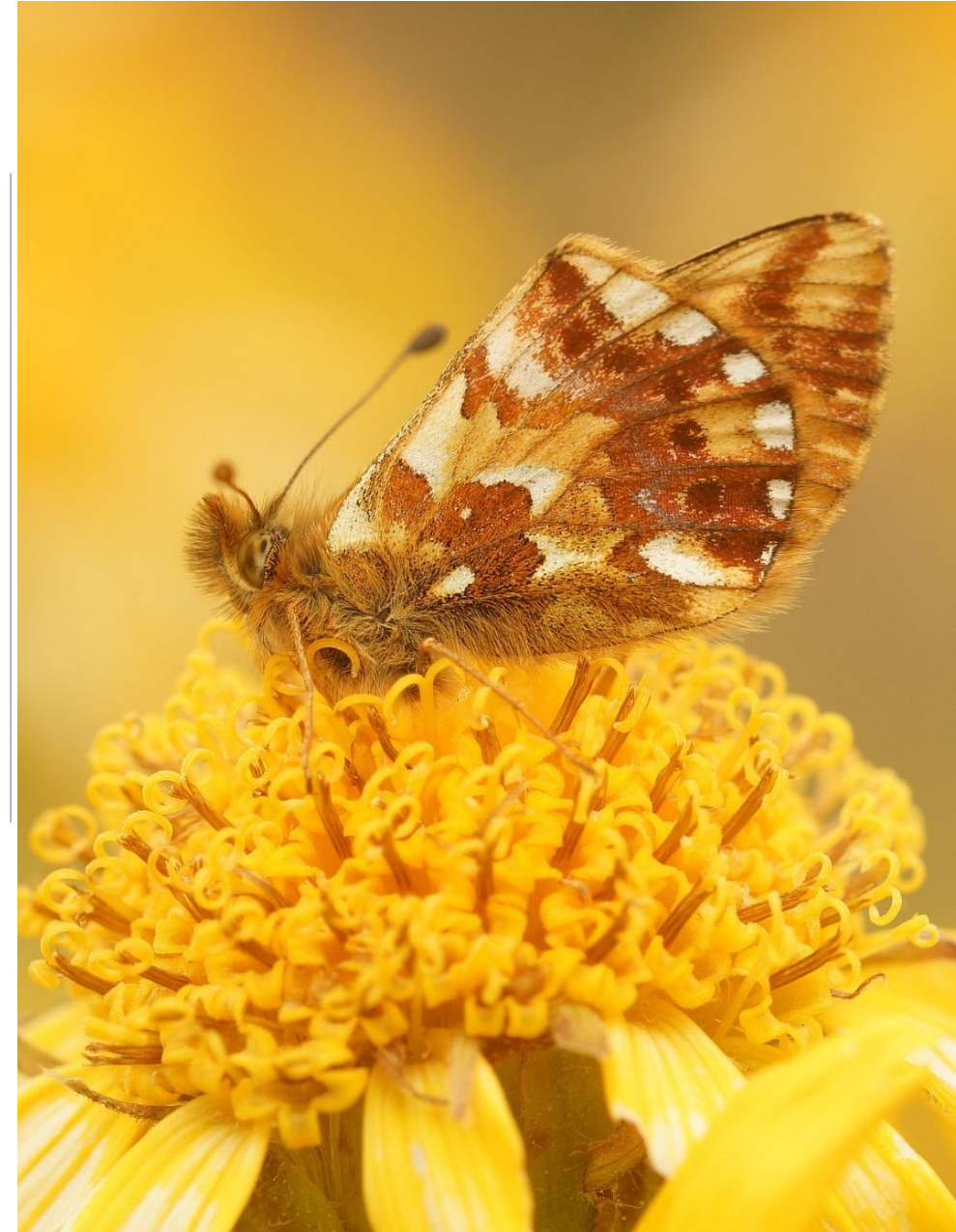
BMS coordinators meeting, 28 October 2020

David Roy & Reto Schmucki



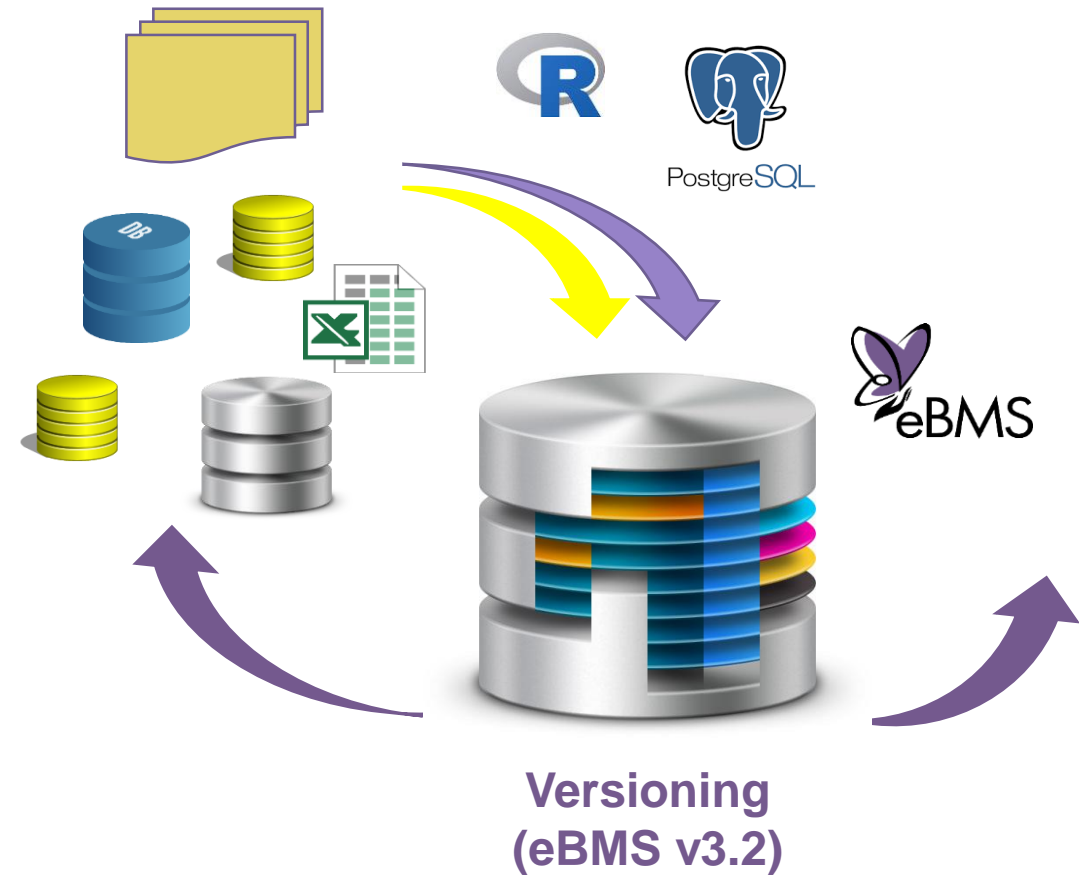
Contents

- ▶ Introduction
- ▶ ABLE Tools
 - eBMS database
 - eBMS online website
 - ButterflyCount App
 - rbms (R package)
- ▶ Next steps



The eBMS concept

- ▶ Comprehensive standardised data model
- ▶ Light and flexible for future development
- ▶ Easy to manage with open-access tools
- ▶ Respect and acknowledge data owners
- ▶ Benefit National BMS and the wider community



SQL Backup in UKCEH, BC Europe and UFZ

The eBMS in Number (1990 – 2018)

▶ **5,086,884 counts**

▶ **913,821 visits**

- 5,239 in 1990

- 66,267 in 2018

▶ **10,816 transects**

- 266 in 1990

- 4,816 in 2018

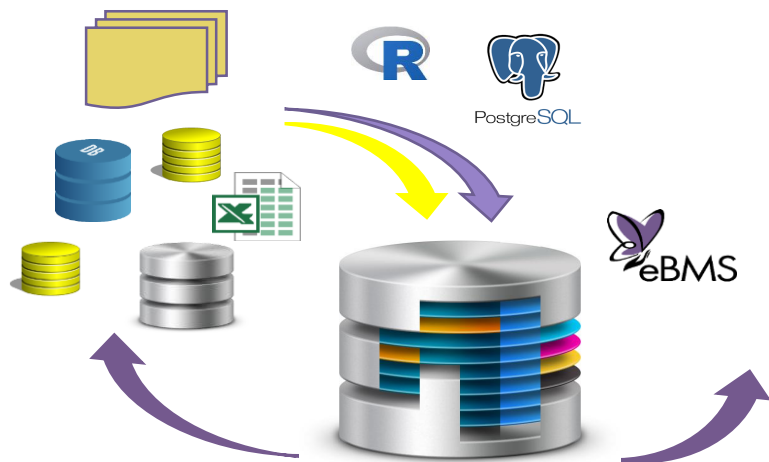
▶ **17,333 km of transect ***

- 527 km in 1990

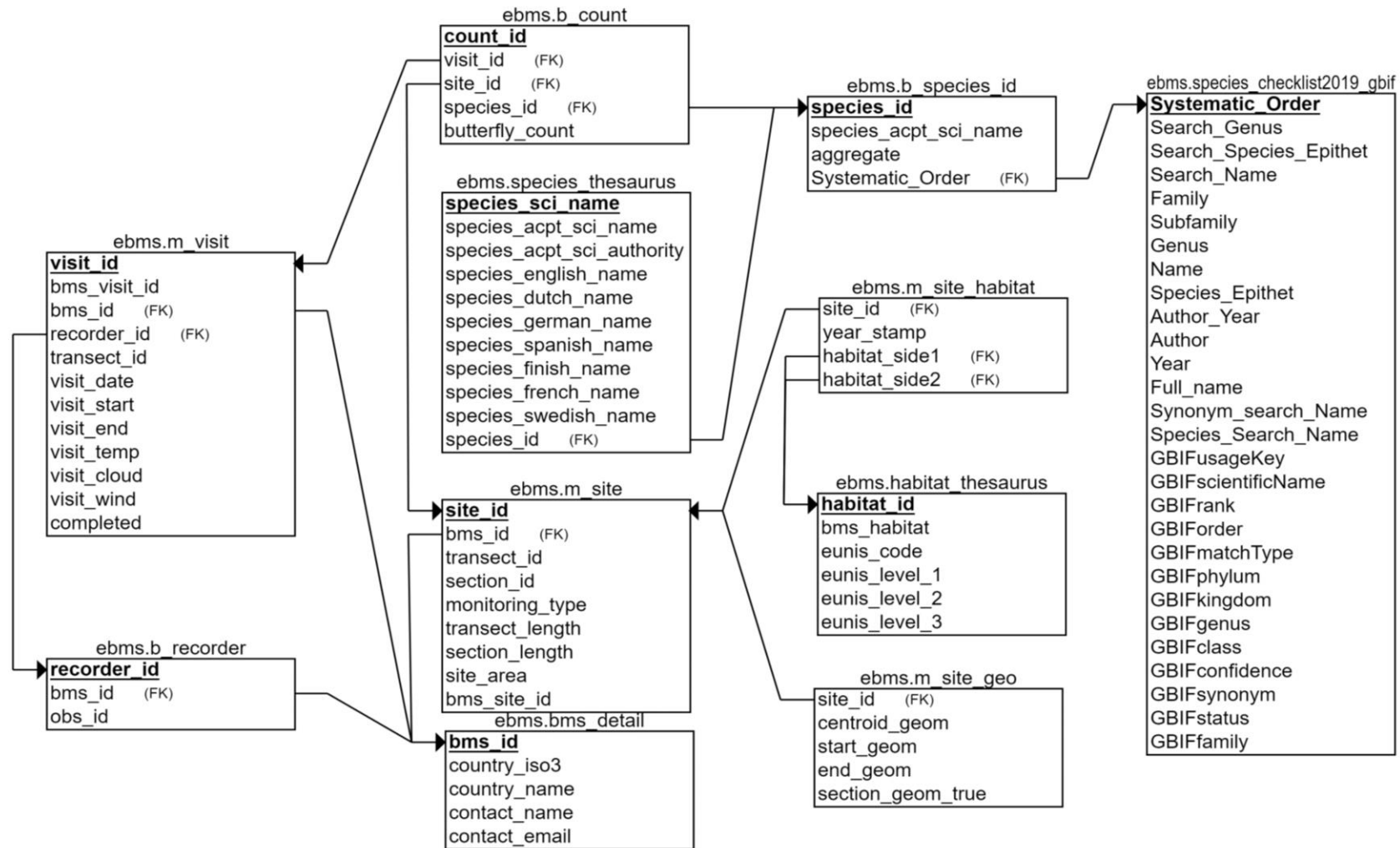
- 7,673 km in 2018

▶ **312 species monitored**

▶ **25 schemes across 22 Countries**

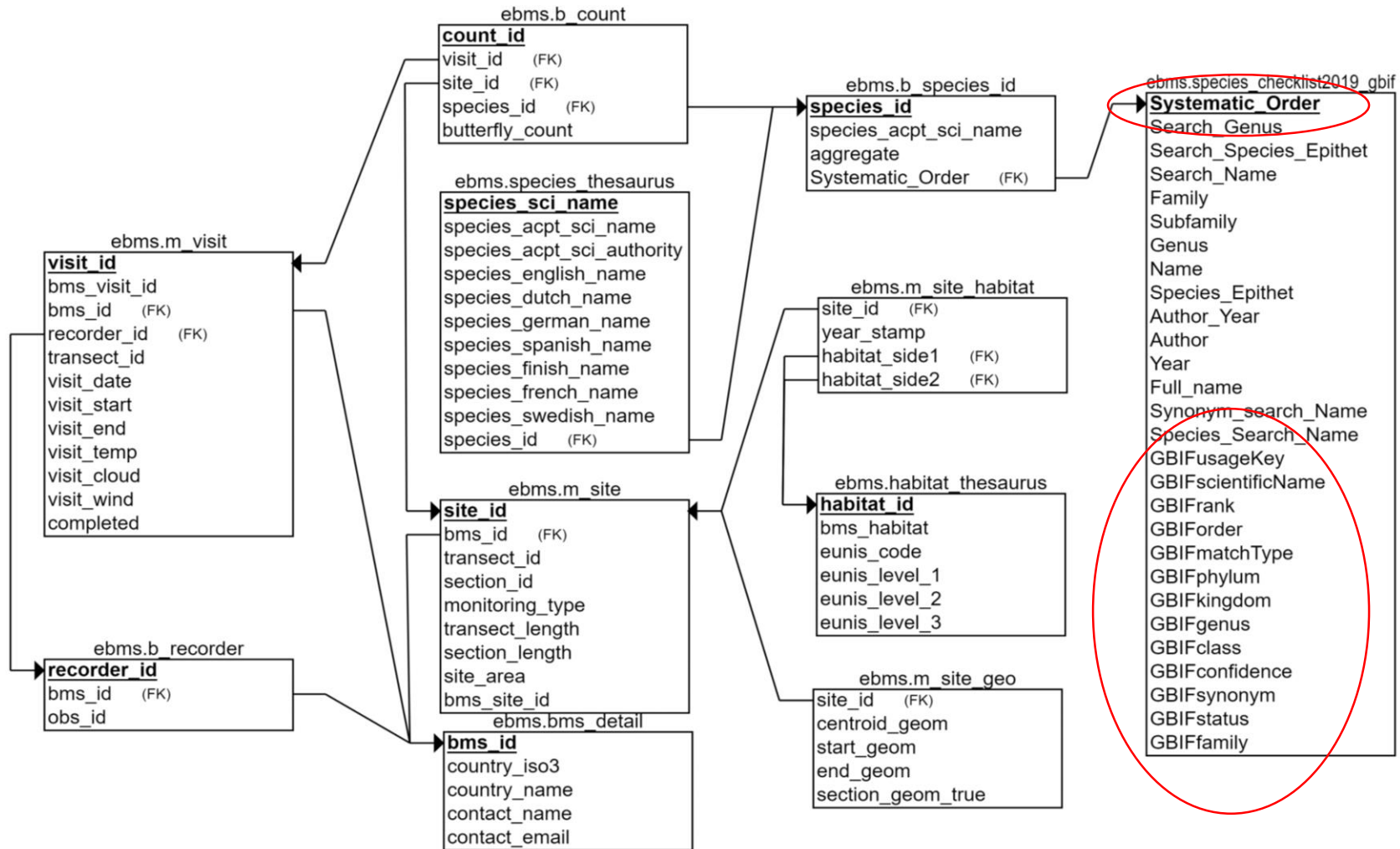


The eBMS data model (v3.0 – June 2020)



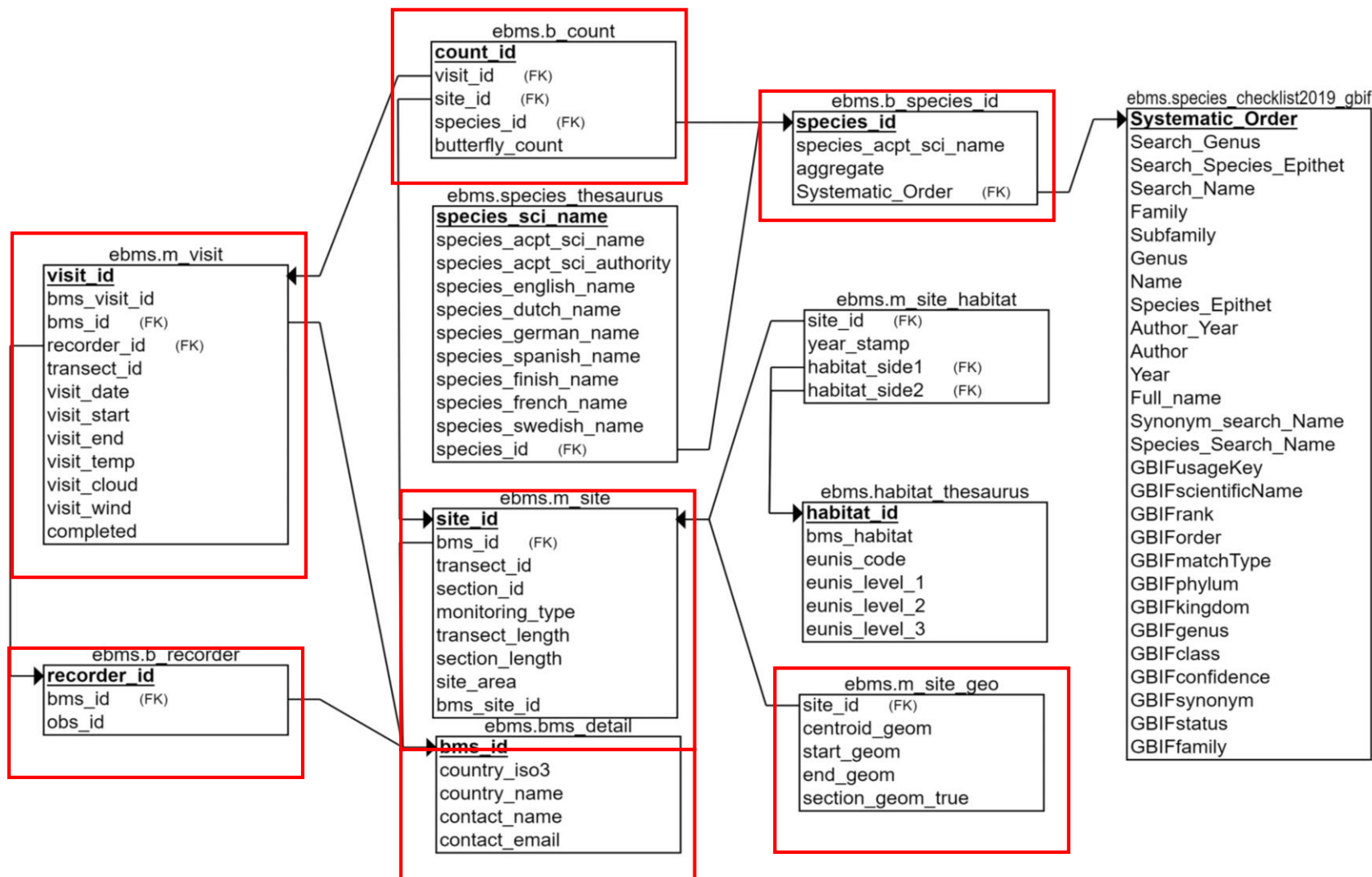
► https://github.com/butterfly-monitoring/ebms_data_model

The eBMS data model (v3.0 – June 2020)



► https://github.com/butterfly-monitoring/ebms_data_model

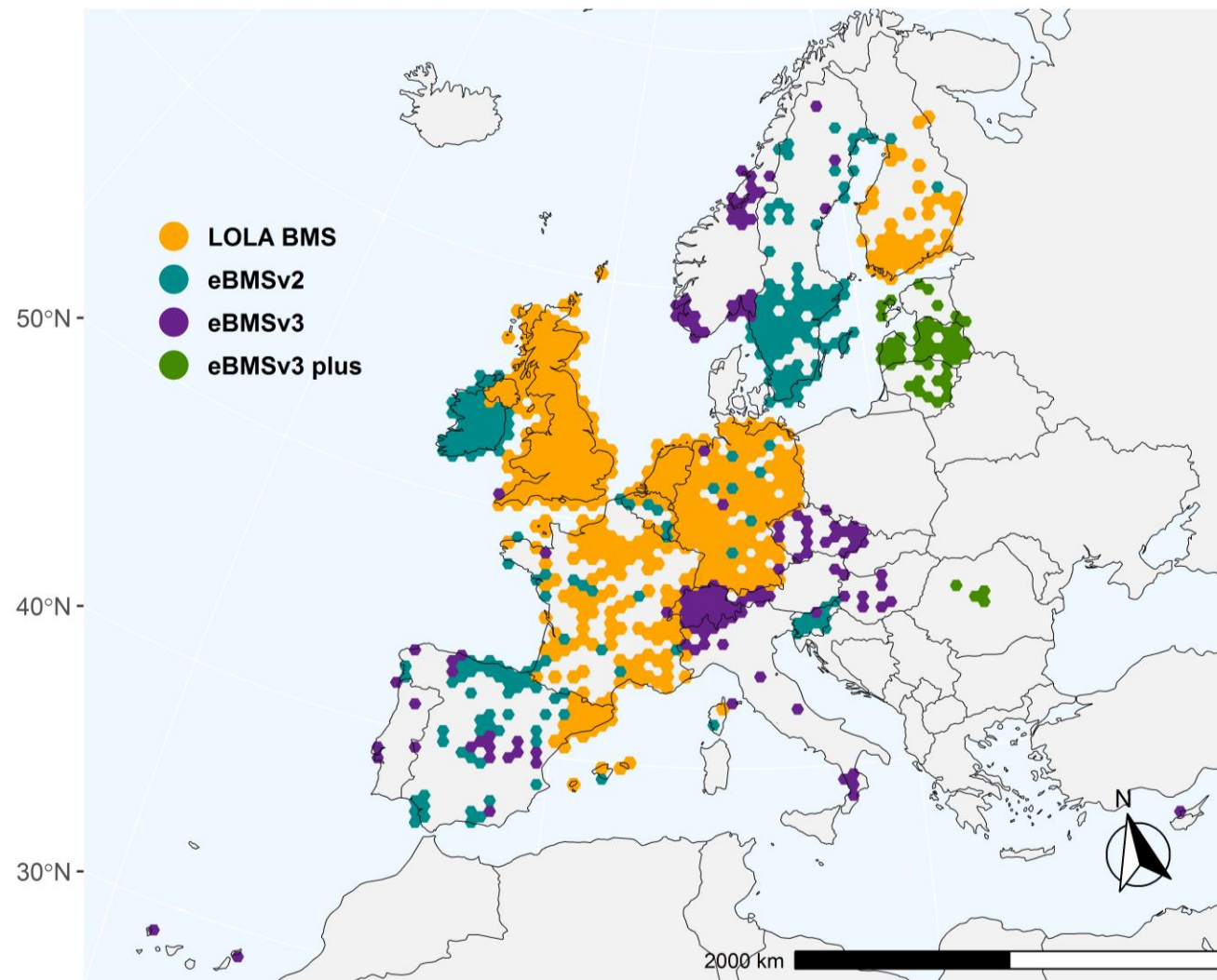
The eBMS data model (v3.0 – June 2020)



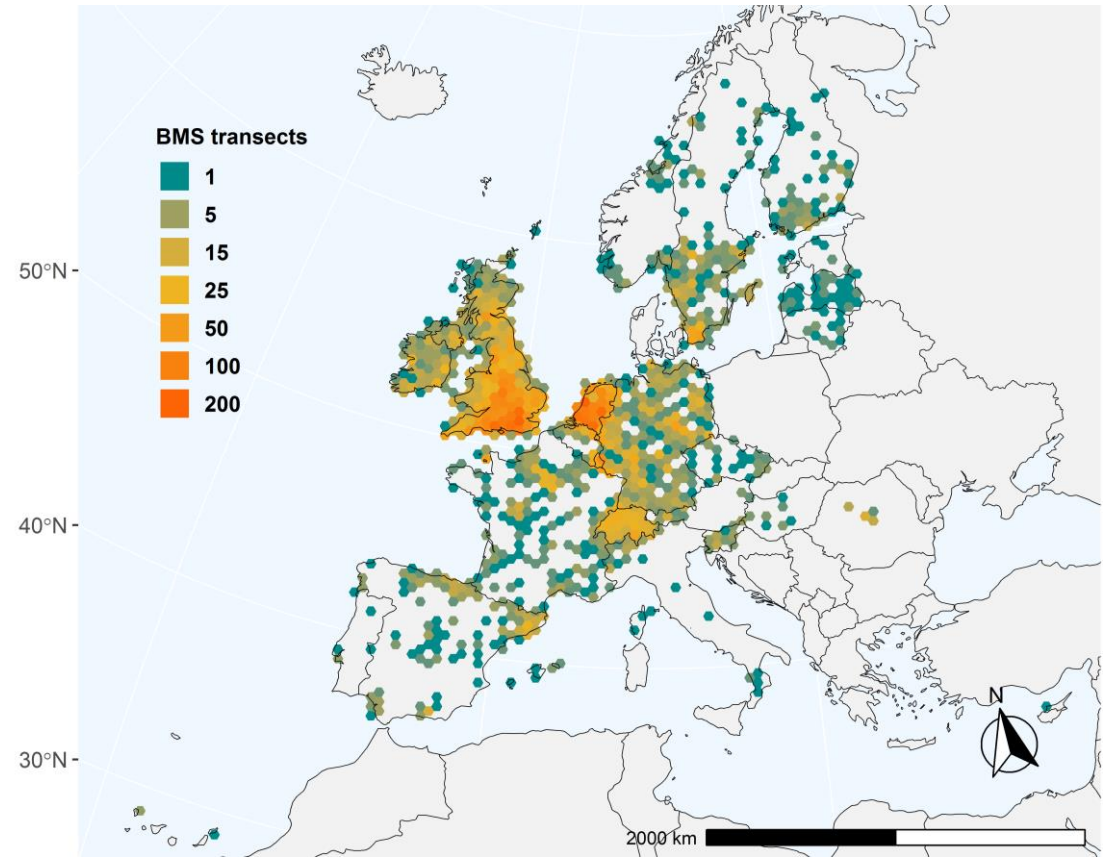
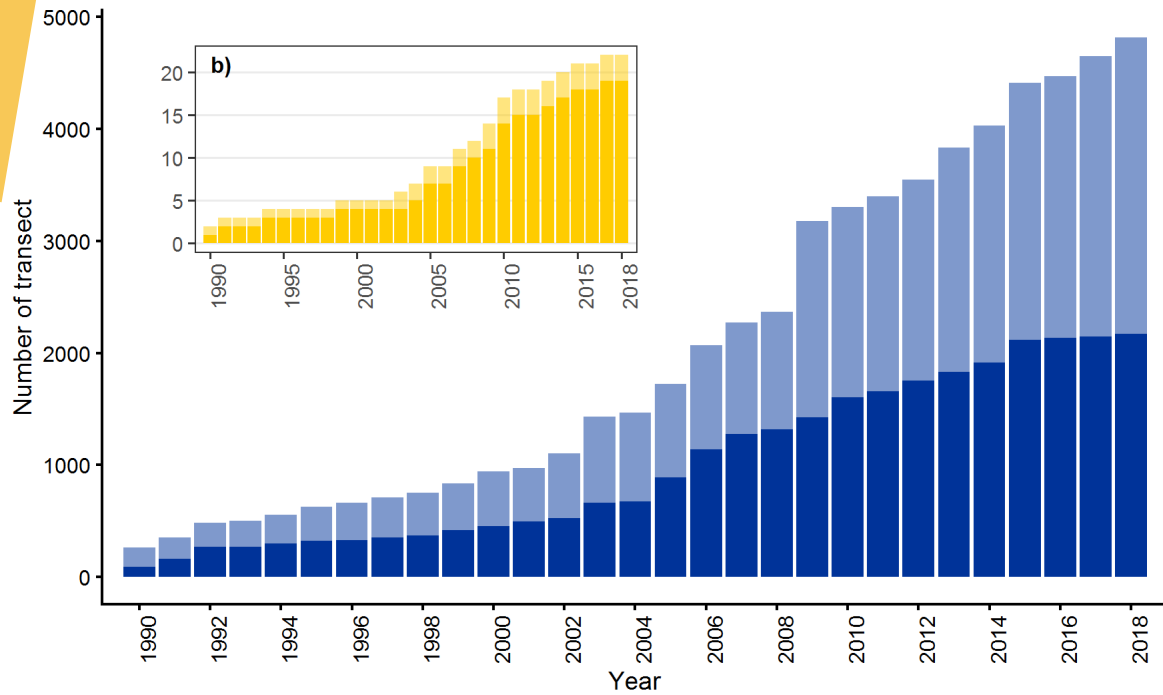
► https://github.com/butterfly-monitoring/ebms_data_model

The eBMS data (Geography)

- ▶ LOLA BMS (6 schemes) – 2014
- ▶ eBMS v2 (13 schemes) – 2018
- ▶ eBMS v3 (21 schemes) – 2020
- ▶ eBMS v3 plus (24 schemes)



The eBMS data (Density)



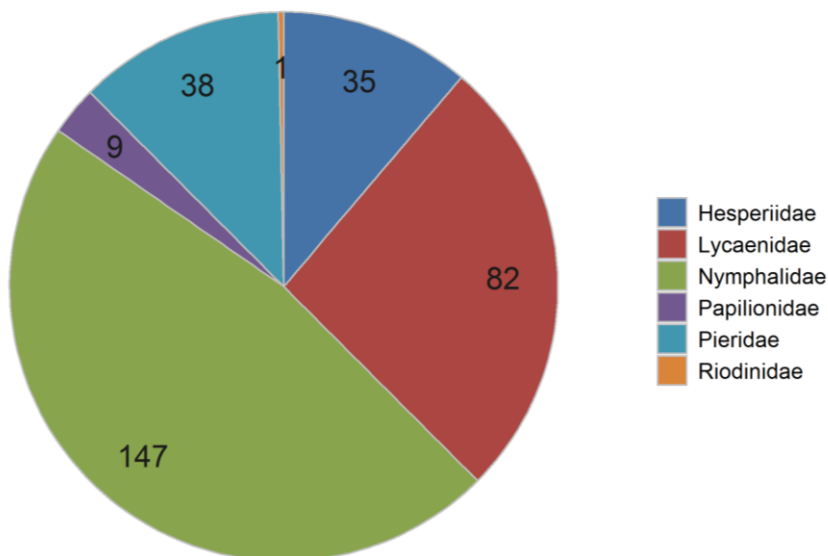
The eBMS data (Taxonomy)

ZooKeys 811: 9–45 (2018)
doi: 10.3897/zookeys.811.28712
<http://zookeys.pensoft.net>

CHECKLIST

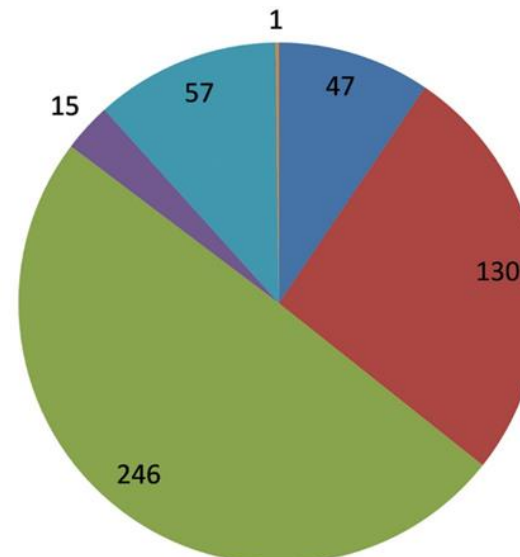
A peer-reviewed open-access journal
ZooKeys
Launched to accelerate biodiversity research

- ▶ Number of butterfly species per Family monitored in eBMS (312 species).



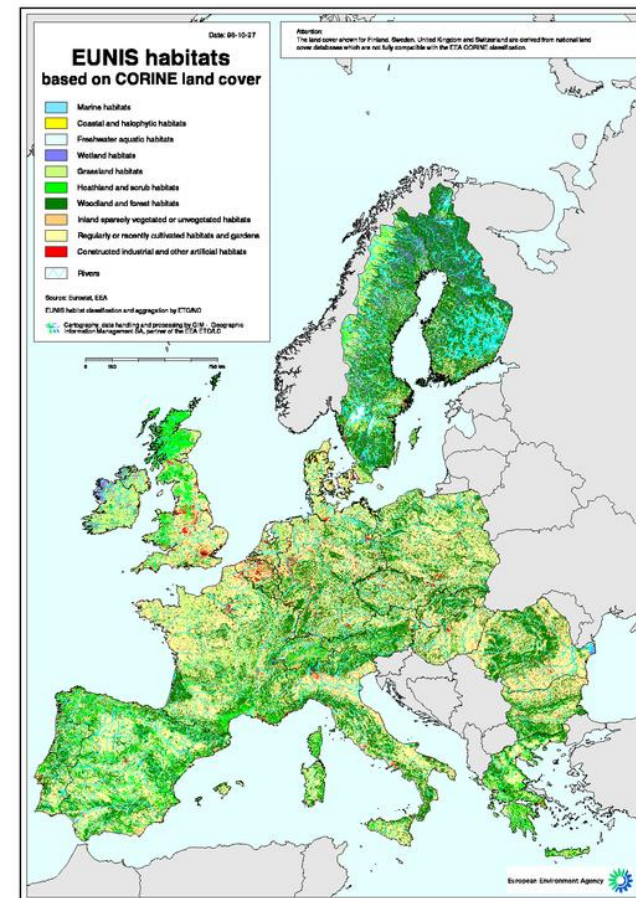
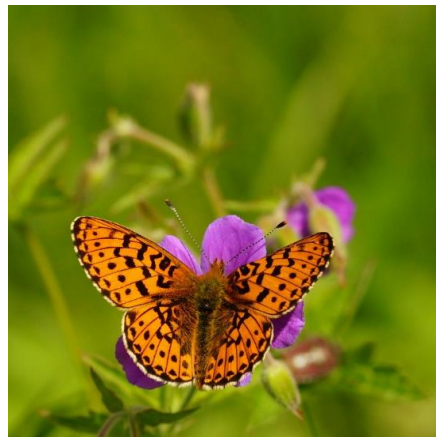
An updated checklist of the European Butterflies (Lepidoptera, Papilionoidea)

Martin Wiemers¹, Emilio Balletto², Vlad Dincă³, Zdenek Faltynek Fric⁴, Gerardo Lamas⁵, Vladimir Lukhtanov⁶, Miguel L. Munguira⁷, Chris A. M. van Swaay⁸, Roger Vila⁹, Albert Vliegthart⁸, Niklas Wahlberg¹⁰, Rudi Verovnik¹¹



The eBMS data (Land Cover)

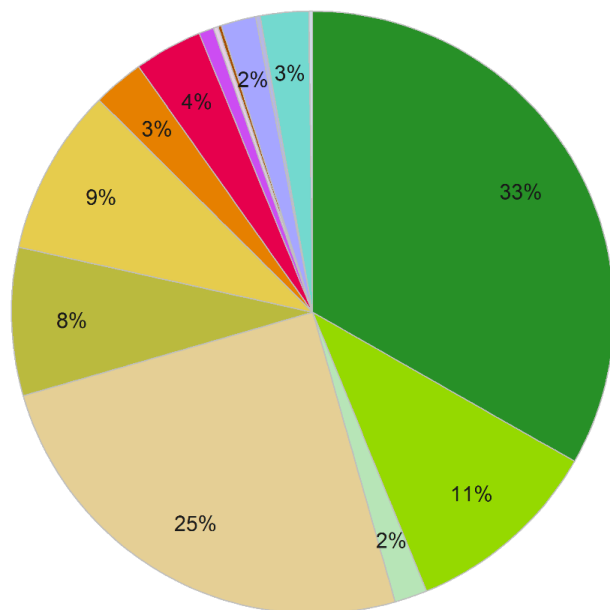
► Transects across European landscapes



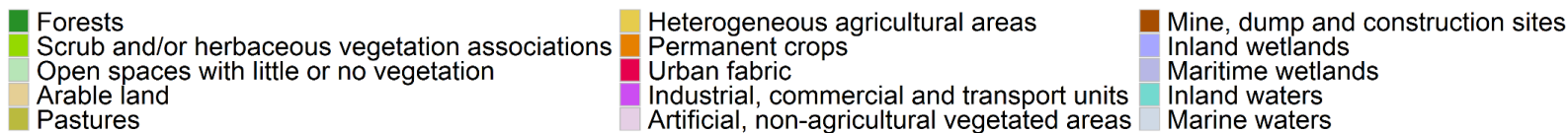
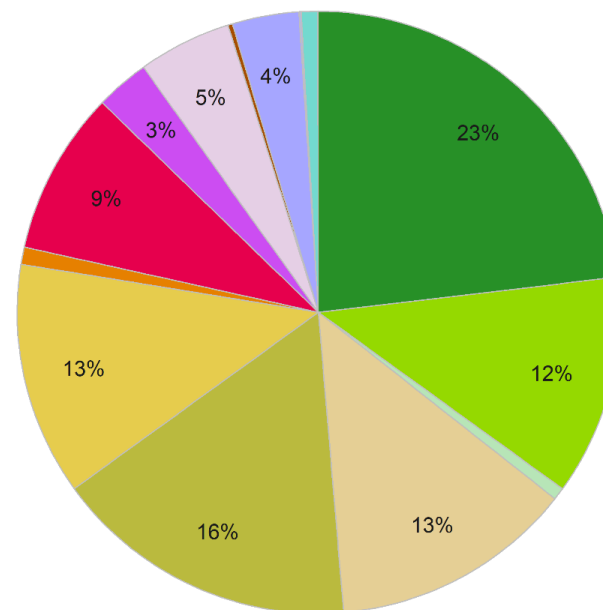
The eBMS data (Land Cover)

► CORINE Land Cover 2018 (100 m resolution)

a) EU27



b) eBMS (EU27)

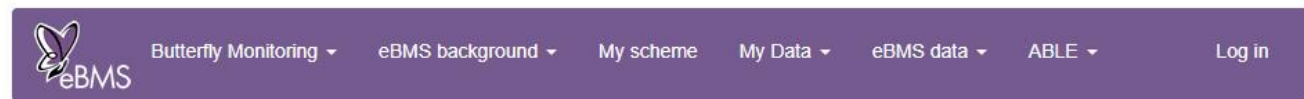


Website to capture transects

► Website to capture transect data and show results.

- Website being used by new schemes
- Multi-lingual
- For volunteers, with co-ordinators in control
- Integrated with ButterflyCount mobile app

<http://butterfly-monitoring.net>



Welcome

European Butterfly Monitoring Scheme - eBMS



Become a volunteer counting butterflies!

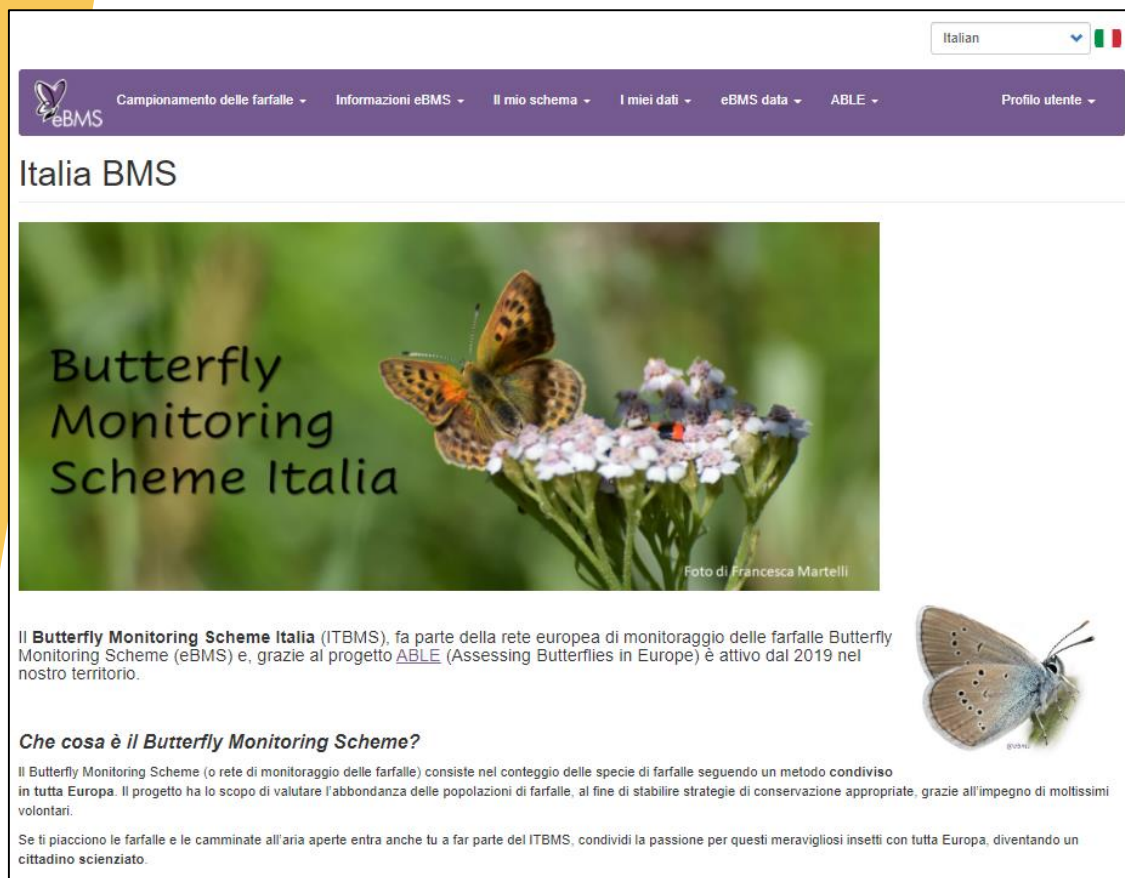
Help us counting butterflies, it will increasing the knowledge of butterflies and we could protect them better. There are already thousands of volunteers throughout Europe helping in butterfly conservation.

If you would like to join to eBMS and collaborate in the Butterfly Monitoring Scheme you just need to register. Follow [this link](#) to the My Data section and you will find a Quick Guide for setting up butterfly monitoring.

- Join one of the biggest citizen science network
- Monitoring butterflies in your area, you will contribute to science

Website to capture transects


<http://butterfly-monitoring.net>



Italian

eBMS Campionamento delle farfalle - Informazioni eBMS - Il mio schema - I miei dati - eBMS data - ABLE - Profilo utente


Italia BMS



Butterfly
Monitoring
Scheme Italia

Foto di Francesca Martelli

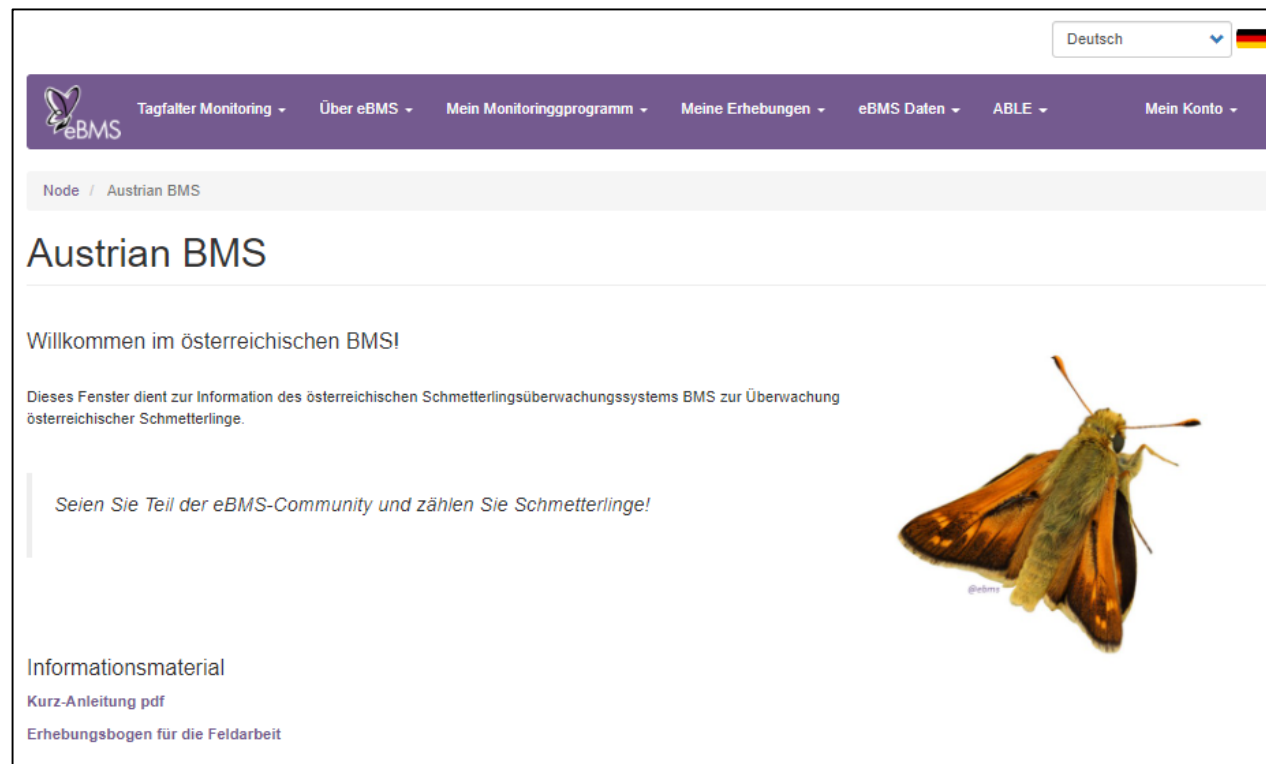
Il **Butterfly Monitoring Scheme Italia** (ITBMS), fa parte della rete europea di monitoraggio delle farfalle Butterfly Monitoring Scheme (eBMS) e, grazie al progetto [ABLE](#) (Assessing Butterflies in Europe) è attivo dal 2019 nel nostro territorio.



Che cosa è il Butterfly Monitoring Scheme?

Il Butterfly Monitoring Scheme (o rete di monitoraggio delle farfalle) consiste nel conteggio delle specie di farfalle seguendo un metodo condiviso in tutta Europa. Il progetto ha lo scopo di valutare l'abbondanza delle popolazioni di farfalle, al fine di stabilire strategie di conservazione appropriate, grazie all'impegno di moltissimi volontari.

Se ti piacciono le farfalle e le camminate all'aria aperte entra anche tu a far parte del ITBMS, condividi la passione per questi meravigliosi insetti con tutta Europa, diventando un cittadino scienziato.



Deutsch

eBMS Tagfalter Monitoring - Über eBMS - Mein Monitoringprogramm - Meine Erhebungen - eBMS Daten - ABLE - Mein Konto


Node / Austrian BMS

Austrian BMS

Willkommen im österreichischen BMS!

Dieses Fenster dient zur Information des österreichischen Schmetterlingsüberwachungssystems BMS zur Überwachung österreichischer Schmetterlinge.

Seien Sie Teil der eBMS-Community und zählen Sie Schmetterlinge!



Informationsmaterial

[Kurz-Anleitung pdf](#)

[Erhebungsbogen für die Feldarbeit](#)

Website to capture transects

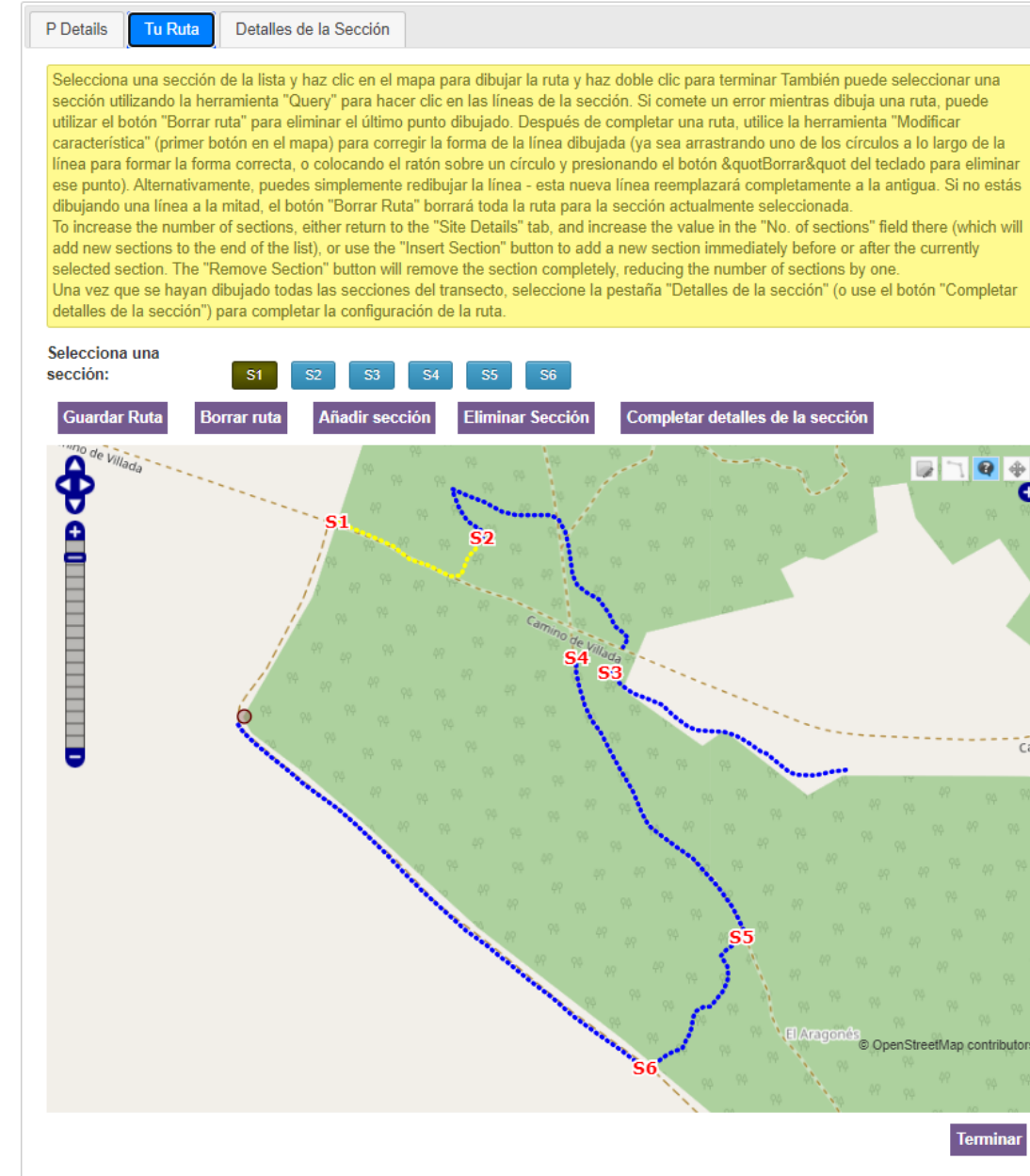
<http://butterfly-monitoring.net>

► For recorders

- Setup transect routes
- Enter transect counts
- See pages for their scheme
- View and download their data

► For co-ordinators

- Same as recorders +
- Assign users to transect routes already setup
- Edit data
- Create new pages for their scheme
- View and download all data for their region



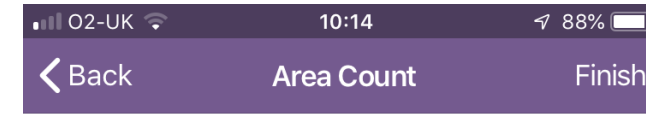
The screenshot displays the web application interface for capturing transects. At the top, there are navigation tabs: "P Details", "Tu Ruta" (highlighted), and "Detalles de la Sección". Below the tabs is a yellow instructional box with text in Spanish explaining how to use the map tools, such as clicking to draw routes, double-clicking to finish, and using buttons like "Borrar ruta" and "Añadir sección".

Below the instructions, there is a section titled "Selecciona una sección:" with a row of buttons labeled S1 through S6. S1 is highlighted in green. Below this are five buttons: "Guardar Ruta", "Borrar ruta", "Añadir sección", "Eliminar Sección", and "Completar detalles de la sección".

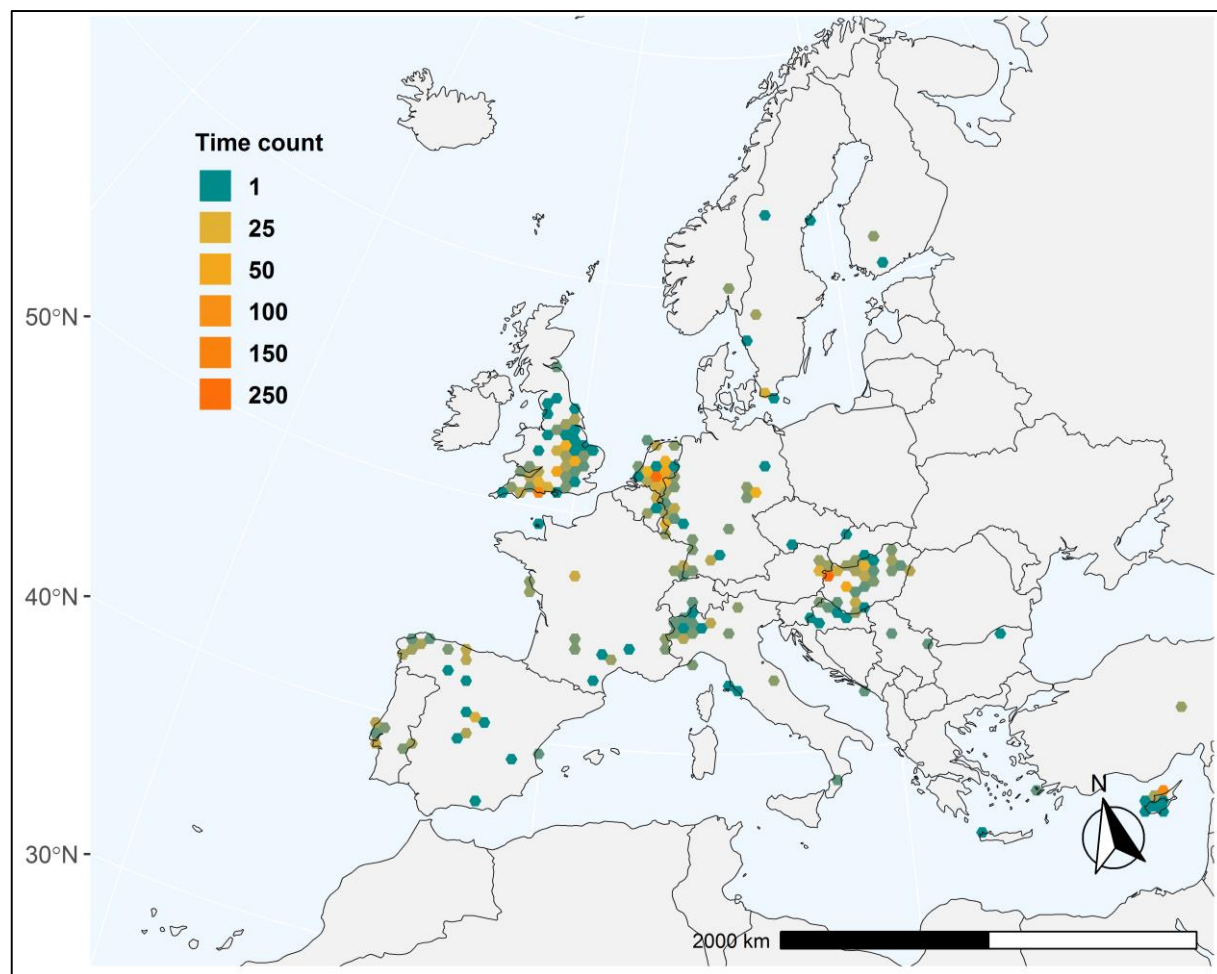
The main part of the interface is a map showing a green field area with a blue dashed line representing a transect route. The route is divided into six segments labeled S1 through S6. S1 is highlighted in yellow. The map includes a compass, a scale bar, and a search bar. The text "Camino de Villada" and "El Aragonés" are visible on the map. At the bottom right, there is a "Terminar" button.

ButterflyCount mobile application

- ▶ Available in multiple languages
- ▶ Guide to species, filtered for each country
- ▶ For entering Transect counts
- ▶ Includes new monitoring method – **15 minute counts**
 - ▶ Anywhere at any time (rare species, remote areas)
 - ▶ Weather data automatically filled in
 - ▶ GPS route tracked or area drawn
 - ▶ Full butterfly list for Europe, plus moths/bumblebees/dragonflies
 - ▶ Freely available for Apple and Android phones
- ▶ Data accessible to view and download (by coordinators) at www.butterfly-monitoring.net



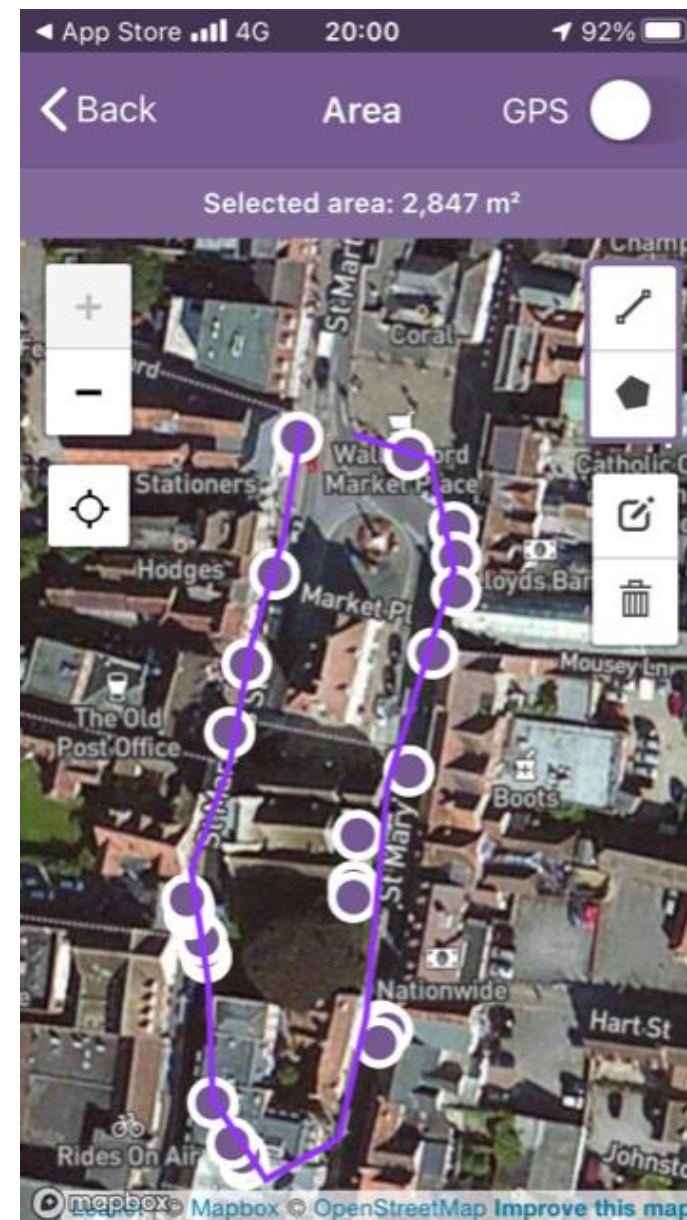
Map of 15 minute counts



Recorders	Records	Species	Samples
Ambrus, Andras	3,149	177	358
van Swaay, Chris	876	164	128
Warren, Martin	676	59	196
van Deijk, Jurriën	576	50	201
Cetinaslan, Marina	324	17	110
Whitfield, Aidan	316	40	43
Szabadfalvi, Andras	305	91	35
Collins, Sur	264	78	33
Laczik, Dénes	228	52	24
Lopez-Vaamonde, Carlos	182	52	25
	10,012	2,129	1,853

Next steps with ButterflyCount app

- ▶ Improved species guide and filtering
 - ▶ Gallery and help with identification
 - ▶ Filter by colour, shape, size etc
 - ▶ Better integration of moths, bumblebees and dragonflies
- ▶ Extend 15 minute count to include a precise location for each individual butterfly seen
- ▶ 'Favourite' sites
- ▶ Activity reports, e.g. top recorders, top species recorded etc



rbms – (R package)

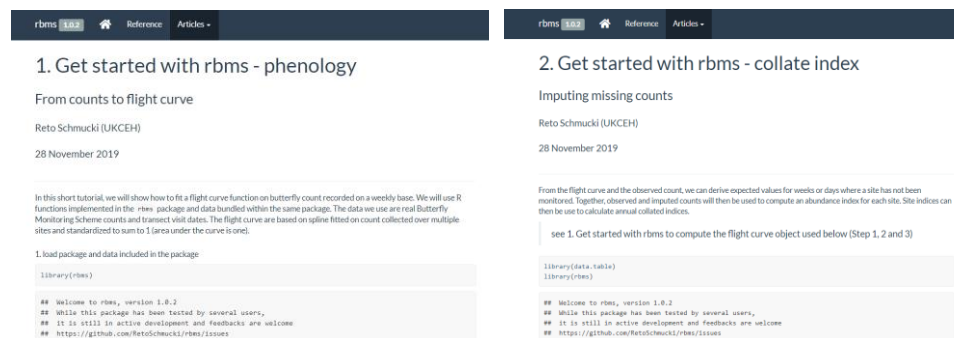
22 functions to interact & analyse BMS data

► Nine essentials

1. `ts_dwmy_table()`
2. `ts_monit_season()`
3. `ts_monit_site()`
4. `ts_monit_count_site()`
5. `flight_curve()`
6. `impute_count()`
7. `site_index()`
8. `collated_index()`
9. `boot_sample()`

Web resources and tutorials

► <https://retoschmucki.github.io/rbms>



The screenshot shows two articles from the rbms GitHub repository website:

- 1. Get started with rbms - phenology**
From counts to flight curve
Reto Schmucki (UKCEH)
28 November 2019
In this short tutorial, we will show how to fit a flight curve function on butterfly count recorded on a weekly base. We will use R functions implemented in the `rbms` package and data bundled within the same package. The data we use are real Butterfly Monitoring Scheme counts and transect visit dates. The flight curve are based on spline fitted on count collected over multiple sites and standardized to sum to 1 (area under the curve is one).
1. load package and data included in the package:

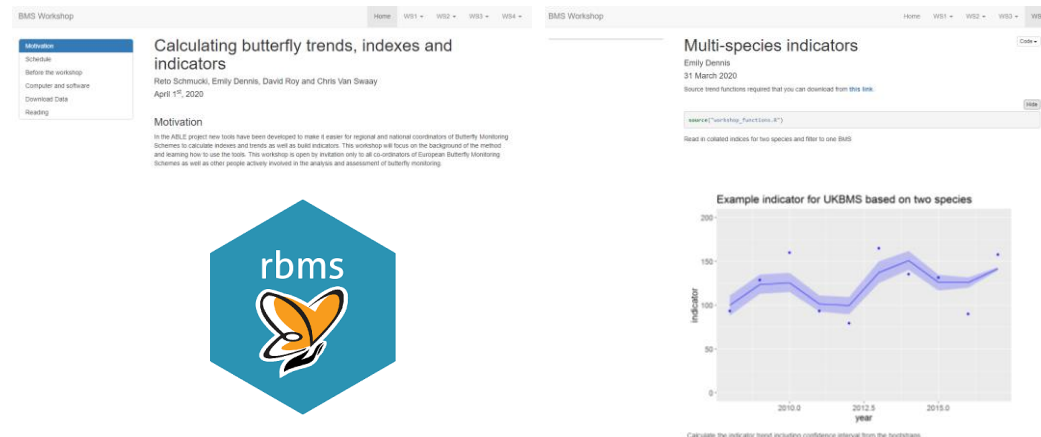
```
library(rbms)
```

```
## Welcome to rbms, version 1.0.2  
## While this package has been tested by several users,  
## it is still in active development and feedbacks are welcome  
## https://github.com/retoschmucki/rbms/issues
```
- 2. Get started with rbms - collate index**
Imputing missing counts
Reto Schmucki (UKCEH)
28 November 2019
From the flight curve and the observed count, we can derive expected values for weeks or days where a site has not been monitored. Together, observed and imputed counts will then be used to compute an abundance index for each site. Site indices can then be used to calculate annual collated indices.
see 1. Get started with rbms to compute the flight curve object used below (Step 1. 2 and 3)

```
library(data.table)  
library(rbms)
```

```
## Welcome to rbms, version 1.0.2  
## While this package has been tested by several users,  
## it is still in active development and feedbacks are welcome  
## https://github.com/retoschmucki/rbms/issues
```

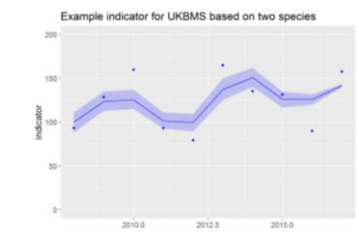
► https://butterfly-monitoring.github.io/bms_workshop/



The screenshot shows the BMS Workshop website with two main sections:

- Calculating butterfly trends, indexes and indicators**
Reto Schmucki, Emily Dennis, David Roy and Chris Van Swaay
April 1st, 2020
Motivation
In the ABLE project new tools have been developed to make it easier for regional and national coordinators of Butterfly Monitoring Schemes to calculate indexes and trends as well as build indicators. This workshop will focus on the background of the methods and learning how to use the tools. This workshop is open by invitation only to all co-ordinators of European Butterfly Monitoring Schemes as well as other people actively involved in the analysis and assessment of butterfly monitoring.
- Multi-species indicators**
Emily Dennis
31 March 2020
Source trend functions required that you can download from this link.

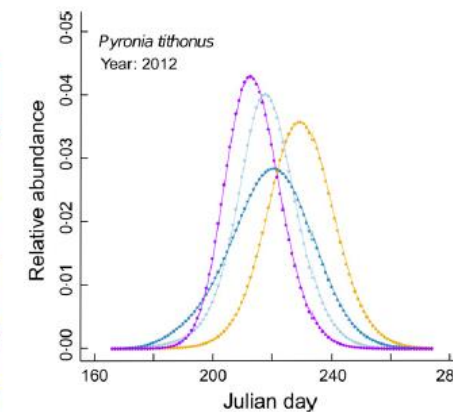
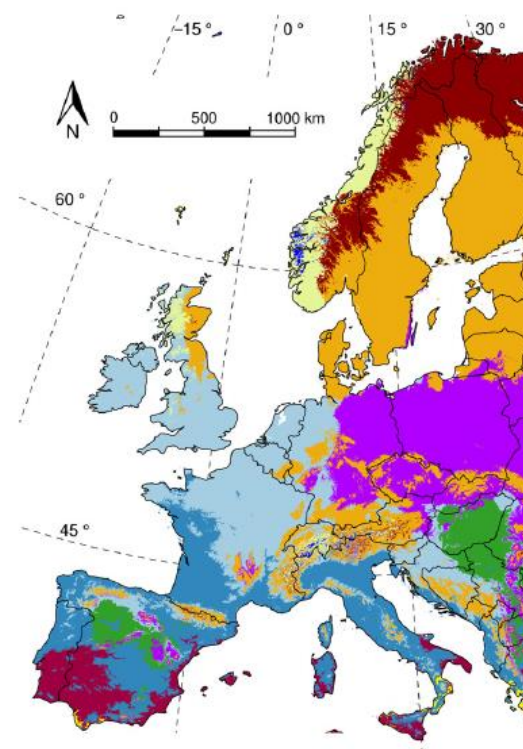
```
source("workshop_functions.R")
```


Read in collated indices for two species and filter to one BMS

Calculate the indicator trend including confidence interval from the bootstraps



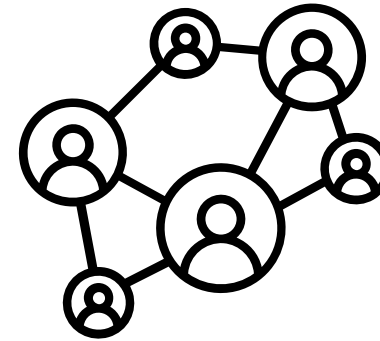
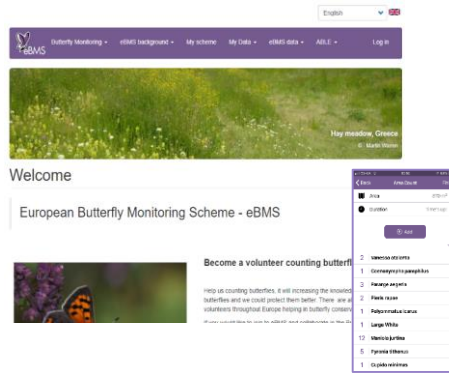
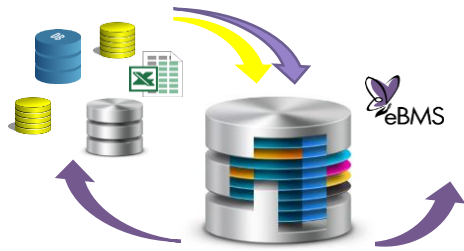
rbms – (Data package)

- ▶ Climate data per grid cell (Temp, Prec, GDD)
- ▶ Species phenology (Weekly)
- ▶ Species distribution (Occupancy)



- Extremely cold & wet
- Extremely cold & mesic
- Cold & wet
- Cold & mesic
- Cold temperate & moist
- Cold temperate & dry
- Cool temperate & xeric
- Warm temperate & mesic
- Warm temperate & xeric
- Hot & dry

eBMS ecosystem



build unknown coverage 63% CRAN 2.1.1 downloads 674/month

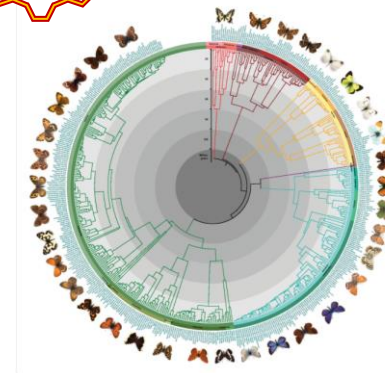
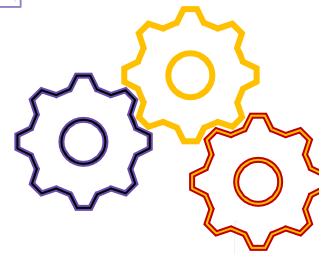
rtrim

Reimplementation of TRIM for R

Installation and getting started

To install `rtrim`, issue the following command at the R console.

```
install.packages("rtrim")
```



A screenshot of the Copernicus and WorldClim web portals. The top part shows the WorldClim interface with a search bar and navigation tabs. Below it is the Copernicus Land Monitoring Service interface, featuring a map of Europe and various data layers like 'CORINE Land Cover', 'High Resolution Land Use', and 'Biophysical Parameters'. The bottom part shows the 'EU SCIENCE HUB' logo and navigation menu.

Next steps eBMS

► Tools

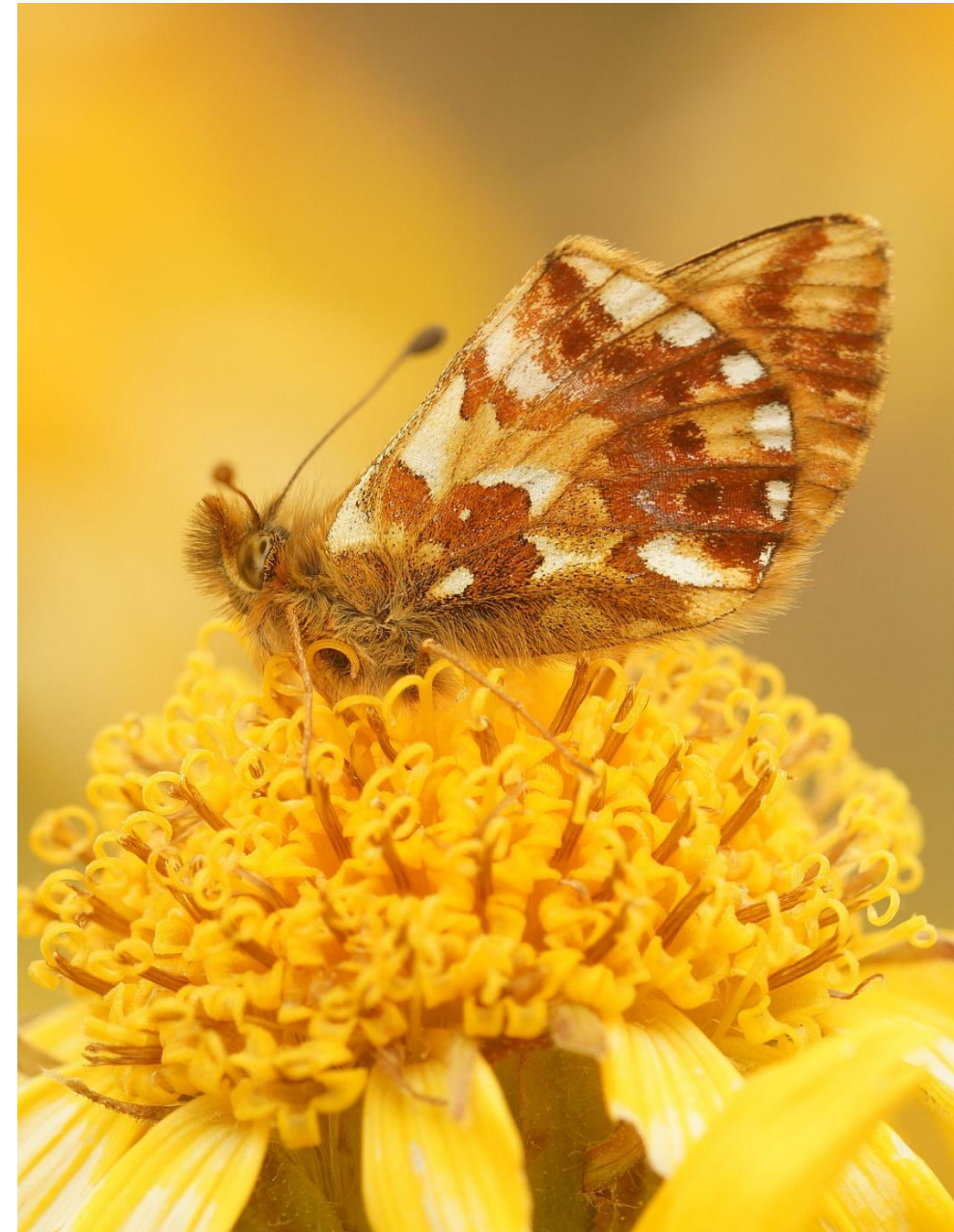
- Improved data capture tools (e.g. ButterflyCount)
- Interactive tutorials and workshops
- Data package

► Analyses

- Phenology covariates (GDD)
- Localised flight curves

► Data

- Habitats
- Monitoring types
- Detailed geometry (multilines, polygons)





Thanks to:

- The EU and MEPs for funding and support
- Many, many people who have helped the ABLE project