Discussion 2: Analysing monitoring data

- New tools and future development

Reto Schmucki – David Roy – Emily Dennis
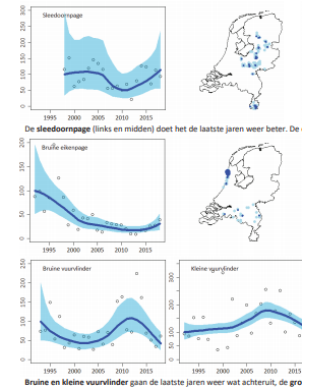
ANL conference centre, Laufen

4 Dec. 2019

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Butterfly count
Site indices
Status and trends

- From the butterfly count to the indices and statistics

- From indices and statistics to knowledge and understanding

Analysing Butterfly counts (BMS)

Biological Conservation
Volume 12, Issue 2, September 1977, Pages 115-134

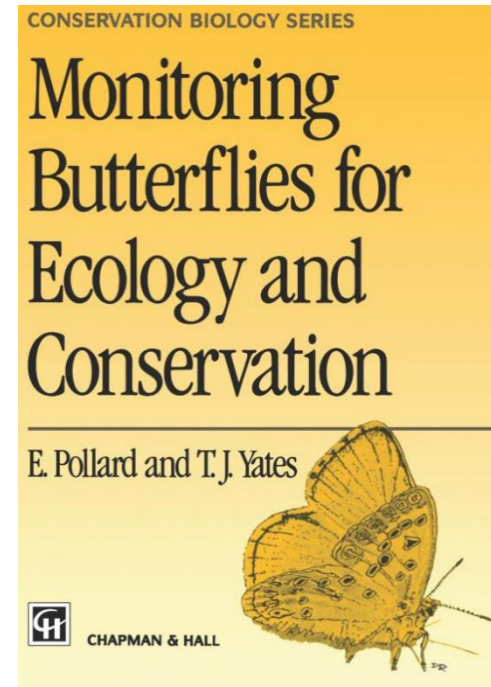**A method for assessing changes in the abundance of butterflies**

E. Pollard

⊞ Show more

https://doi.org/10.1016/0006-3207(77)90065-9   Get rights and content

Abstract

A method based on transect count has been developed to assess changes in abundance of butterflies from year to year. The method involves weekly walks around atransect route making counts of butterflies seen within defined limits. The transects are divided into sections related to habitat or management units. Walks

CONSERVATION BIOLOGY SERIES

Monitoring Butterflies for Ecology and Conservation

E. Pollard and T. J. Yates

CHAPMAN & HALL

➢ Pollard, E. (**1977**). A method for assessing changes in the abundance of butterflies. *Biological Conservation*, *12*(2), 115–134. doi: 10.1016/0006-3207(77)90065-9

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3

Analysing Butterfly counts (BMS)

➢ Moss, D., & Pollard, E. (**1993**). Calculation of collated indices of abundance of butterflies based on monitored sites. *Ecological Entomology*, *18*(1), 77–83. doi: 10.1111/j.1365-2311.1993.tb01083.x

➢ Rothery, P., & Roy, D. B. (**2001**). Application of generalized additive models to butterfly transect count data. *Journal of Applied Statistics*, *28*(7), 897–909. doi: 10.1080/02664760120074979

➢ Van Swaay, C.A.M., Plate, C. & Van Strien, A.J. (**2002**) Monitoring butterflies in the Netherlands: how to get unbiased indices. Proc. of the Sect. Exp. and Appl. Ent. of the Netherlands Ent. Soc., 13, 21–27

Ecological Entomology

Calculation of collated indices of abundance of butterflies based on monitored sites

D. MOSS, E. POLLARD

First published: February 1993 | https://doi.org/10.1111/j.1365-2311.1993.tb01083.x | Citations: 10

Original Articles

Application of generalized additive models to butterfly transect count data

Peter Rothery & David B. Roy
Pages 897-909 | Published online: 02 Aug 2010

❝ Download citation | ➦ https://doi.org/10.1080/02664760120074979

Monitoring butterflies in the Netherlands: how to get unbiased indices

C.A.M. van Swaay[1], C.L. Plate[2] & A.J. van Strien[2]

[1] De Vlinderstichting - Dutch Butterfly Conservation, PO Box 506, 6700 AM Wageningen, The Netherlands; [2] Centraal Bureau voor de Statistiek – Statistics Netherlands, PO Box 4000, 2270 JM Voorburg, The Netherlands (chris.vanswaay@vlinderstichting.nl)

Analysing Butterfly counts (BMS)

➢ Dennis, E. B., Freeman, S. N., Brereton, T., & Roy, D. B. (**2013**). Indexing butterfly abundance whilst accounting for missing counts and variability in seasonal pattern. *Methods in Ecology and Evolution*, *4*(7), 637–645. doi: 10.1111/2041-210X.12053

➢ Schmucki, R., Pe'er, G., Roy, D. B., Stefanescu, C., Van Swaay, C. A. M., Oliver, T. H., … Julliard, R. (**2016**). A regionally informed abundance index for supporting integrative analyses across butterfly monitoring schemes. *Journal of Applied Ecology*, *53*(2), 501–510. doi: 10.1111/1365-2664.12561

➢ Dennis, E. B., Morgan, B. J. T., Freeman, S. N., Brereton, T. M., & Roy, D. B. (**2016**). A generalized abundance index for seasonal invertebrates. *Biometrics*, *72*(4), 1305–1314. doi: 10.1111/biom.12506

Methods in Ecology and Evolution | BRITISH ECOLOGICAL SOCIETY

Standard Paper | 🔓 Free Access

Indexing butterfly abundance whilst accounting for missing counts and variability in seasonal pattern

Emily B. Dennis ✉, Stephen N. Freeman, Tom Brereton, David B. Roy

First published: 26 March 2013 | https://doi.org/10.1111/2041-210X.12053 | Citations: 18

Journal of Applied Ecology | British Ecological Society

Journal of Applied Ecology 2016, **53**, 501–510   doi: 10.1111/1365-2664.12561

A regionally informed abundance index for supporting integrative analyses across butterfly monitoring schemes

Reto Schmucki[1,2*], Guy Pe'er[3,4], David B. Roy[5], Constantí Stefanescu[6,7], Chris A.M. Van Swaay[8], Tom H. Oliver[5,9], Mikko Kuussaari[10], Arco J. Van Strien[11], Leslie Ries[12,13], Josef Settele[4,14], Martin Musche[14], Jofre Carnicer[6,15], Oliver Schweiger[14],

A Generalized Abundance Index for Seasonal Invertebrates

Emily B. Dennis,[1,3,*] Byron J. T. Morgan,[1] Stephen N. Freeman,[2] Tom M. Brereton,[3] and David B. Roy[2]

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Site indices to inform local trends

European butterfly populations vary in sensitivity to weather across their geographical ranges

Simon C. Mills[1] | Tom H. Oliver[2] | Richard B. Bradbury[3,4,5] | Richard D. Gregory[4,6] | Tom Brereton[7] | Elisabeth Kühn[8] | Mikko Kuussaari[9] | Martin Musche[8] | David B. Roy[10] | Reto Schmucki[10] | Constantí Stefanescu[11,12] | Chris van Swaay[13] | Karl L. Evans[1]

Conservation Biology

Contributed Paper | 🔓 Full Access |

Effects of Natura 2000 on nontarget bird and butterfly species based on citizen science data

V. Pellissier ✉, R. Schmucki, G. Pe'er, A. Aunins, T.M. Brereton, L. Brotons, J. Carnicer, T. Chodkiewicz, P. Chylarecki, J.C. del Moral, V. Escandell, D. Evans, R. Foppen, A. Harpke, J. Heliölä ... See all authors ⌄

➢ Mills, S. C., Oliver, T. H., Bradbury, R. B., Gregory, R. D., Brereton, T., Kühn, E., ... Evans, K. L. (**2018**). European butterfly populations vary in sensitivity to weather across their geographical ranges. *Global Ecology and Biogeography*, *26*(12), 1374–1385. doi: 10.1111/geb.12659

➢ Pellissier, V., Schmucki, R., Pe'er, G., Aunins, A., Brereton, T. M., Brotons, L., ... Julliard, R. (**2019**). Effects of Natura 2000 on nontarget bird and butterfly species based on citizen science data. *Conservation Biology*, *n/a*(n/a). doi: 10.1111/cobi.13434

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Butterfly indicators to inform National and International trends

Figure C6iii. Trends for butterflies of the wider countryside in UK woodland, 1990 to 2018.
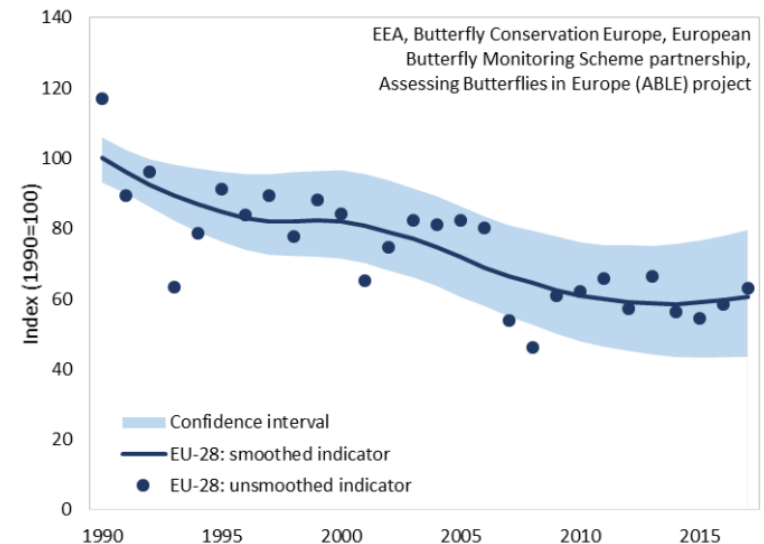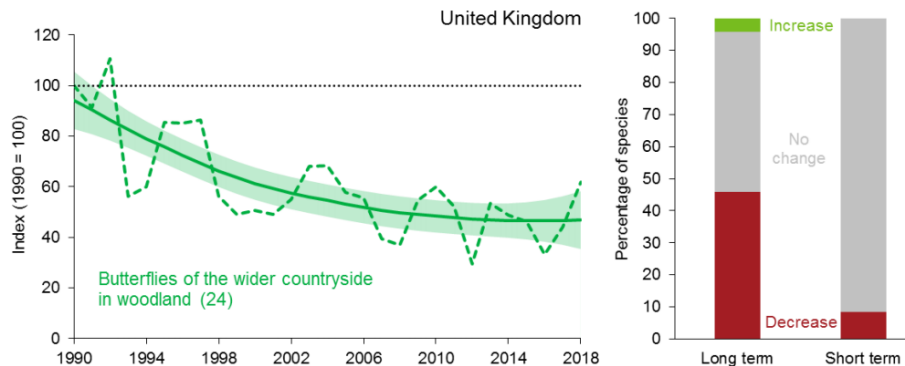
➤ Department for Environment, Food and Rural Affairs, UK (**2019**). UK Biodiversity Indicators 2019.

➤ Van Swaay, C.A.M., Dennis, E.B., Schmucki, R., Sevilleja, C.G., Balalaikins, M., … & Roy, D.B. (**2019**). The EU Butterfly Indicator for Grassland species: 1990-2017: Technical Report. Butterfly Conservation Europe & ABLE/eBMS (www.butterfly-monitoring.net)

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Building capacity

Collecting & data curation
- ✓ **Indica (data warehouse & tools)**
- ✓ **eBMS app**
- ✓ **eBMS database**
- ✓ **GBIFF**

Analysing
- • **R packages**
  - ✓ **BRCindicator**
  - ✓ **rtrim**
  - ✓ **MSI**
  - ✓ **rbms**

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Photo: Chris van Swaay

Monitoring & Data science "ecosystem"

rbms – R package

➢ Generalised Abundance Indices (GAI) – spline

➢ Phenology – flight curve

➢ Site abundance indices

➢ Collated index

➢ Bootstrap confidence interval

https://retoschmucki.github.io/rbms/

rbms – R package

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).
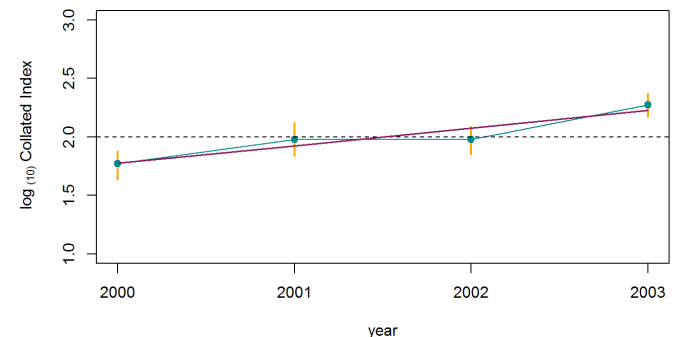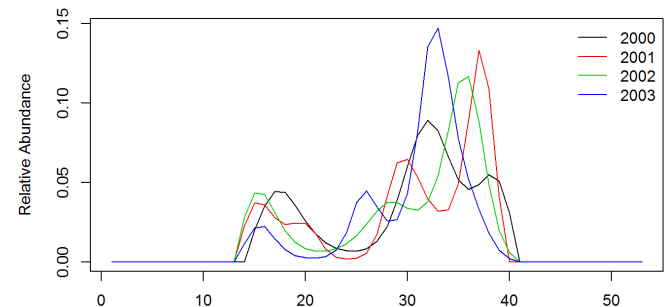
1. load package and data included in the package

```
library(rbms)
```

```
##  Welcome to rbms, version 1.0.0
##  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
```
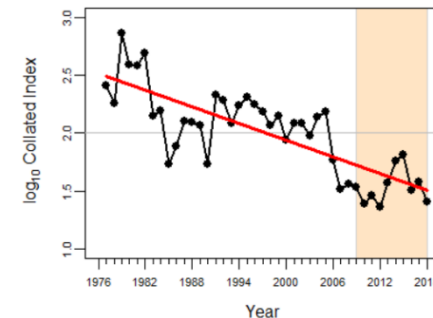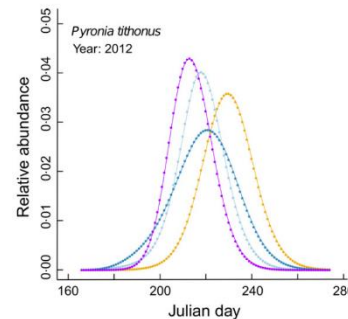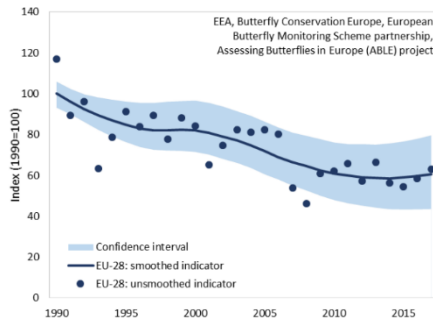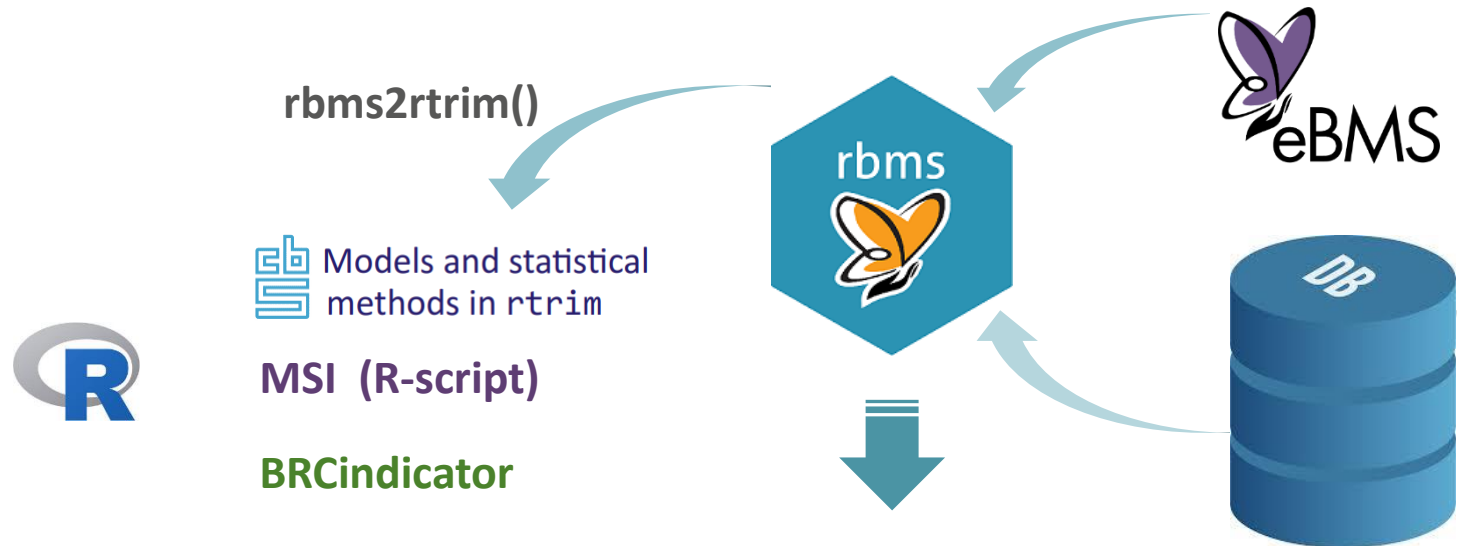
```
data(m_visit)
data(m_count)
```

The visit and count data are packaged in `data.table` format, but can also be provided as `data.frame`. The function will convert them into `data.table` as this format allow us to deal with large data sets in a more efficient way. On the other hand, header names need to be consistent and some columns are essential for the functions to work.
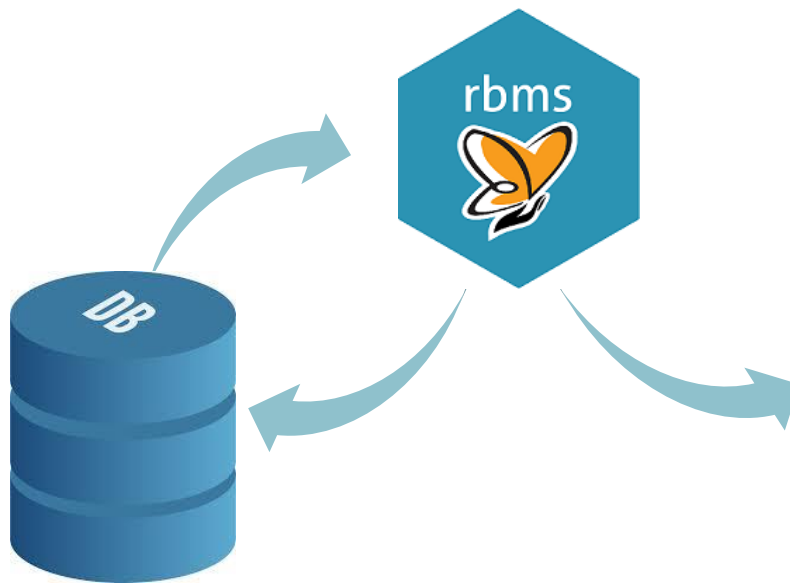

https://retoschmucki.github.io/rbms/

Augment the capabilities of rbms

rbms2rtrim()

Models and statistical
methods in rtrim

MSI (R-script)

BRCindicator

Augment the capabilities of rbms

- ➤ Taxonomy resolution tools from standardized check-lists

- ➤ Facilitate data transfer and contribution to eBMS

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Wish list, feedbacks and prioritization

- **Analysis (new methods)**

- **Visualisation**

- **Data management**

- **… ?**

Thank you

Any questions?

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Photo: Chris van Swaay