Data on the movement behaviour of four species of grassland butterfly

Article

Published Version

Creative Commons: Attribution 4.0 (CC-BY)

Open Access

Evans, Luke C., Sims, Ian, Sibly, Richard M., Thorbek, Pernille, Oliver, Tom H. and Walters, Richard J. (2019) Data on the movement behaviour of four species of grassland butterfly. Data in Brief, 27. 104611. ISSN 2352-3409 doi: https://doi.org/10.1016/j.dib.2019.104611 Available at https://centaur.reading.ac.uk/87395/

It is advisable to refer to the publisher's version if you intend to cite from the work. See Guidance on citing.

To link to this article DOI: http://dx.doi.org/10.1016/j.dib.2019.104611

Publisher: Elsevier

All outputs in CentAUR are protected by Intellectual Property Rights law, including copyright law. Copyright and IPR is retained by the creators or other copyright holders. Terms and conditions for use of this material are defined in the End User Agreement.

www.reading.ac.uk/centaur

CentAUR
Central Archive at the University of Reading
Reading’s research outputs online
Data Article

Data on the movement behaviour of four species of grassland butterfly

Luke C. Evans a, *, Ian Sims b, Richard M. Sibly a, Pernille Thorbek b, c, Tom H. Oliver a, Richard J. Walters a, d

a School of Biological Sciences, University of Reading, Whiteknights, PO Box 217, Reading, Berkshire, RG6 6AH, UK
b Syngenta, Jealott’s Hill International Research Centre, Bracknell, Berkshire, RG42 6EY, UK
c BASF SE, APD/EE, Speyerer Strasse 2, 67117, Limburgerhof, Germany
d Centre for Environmental and Climate Research, University of Lund, Sweden

ARTICLE INFO

Article history:
Received 30 August 2019
Received in revised form 24 September 2019
Accepted 26 September 2019
Available online 4 October 2019

Keywords:
Movement movement-ecology random-walk behaviour Lepidoptera

ABSTRACT

This Data in Brief article describes data on the movement behaviour of four species of grassland butterflies collected over three years and at four sites in southern England. The datasets consist of the movement tracks of Maniola jurtina, Aricia agestis, Pyronia tithonus, and Melanargia galathea, recorded using standard methods and presented as steps distances and turning angles. Sites consisted of nectar-rich field margins, meadows, and mown short turf grasslands with minimal flowers. In total, 783 unique movement tracks were collected. The data were used for analysing the movement behaviour of the species and for parameterising individual-based movement models.

© 2019 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).
The dataset consists of movement and behavioural observations of four species of grassland butterfly measured at four sites in southern England. The data files were deposited in Mendeley data (https://doi.org/10.17632/kpcgkfmpv8.1) and consist of two tables representing 783 unique movement tracks. Data collected in 2016 and 2017 are supplementary to [1] and data from 2017 and 2018 to [2].

### Specifications Table

| Subject                      | Ecology                     |
|------------------------------|-----------------------------|
| Specific subject area        | Movement ecology, butterflies|
| Type of data                 | Table                       |
| How data were acquired       | Butterfly positions were recorded with a GNSS receiver (Arrow 200 RTK) with accuracy < 30 cm. Behaviours were timed on a custom Android phone app. Meteorological variables were recorded from weather stations < 3km from the sites and sunshine was recorded using data loggers deployed at sites (HOBO pendant). |
| Data format                  | Processed                   |
| Parameters for data collection | Data on butterfly movements were collected in the summers of 2016–2018 at four sites in southern England. Observations took place primarily between 10:00 am and 16:00 pm and in dry conditions, though air temperature and cloud cover varied widely. |
| Description of data collection | Butterflies were observed in the field with the positions of individuals recorded by placing a numbered marker flag, either at each landing site or after every 15 seconds during a continuous flight [3,4]. The precise location of each flag was then mapped using a Global Navigation Satellite System receiver (Arrow 200 RTK). Flight duration and behaviour were recorded on a bespoke Android App developed for the project. Records of location, time and behaviour were processed to calculate the distance between successive flags as step distances and the angle subtended between consecutive flags as turning angles. |
| Data source location         | North farm                   |
|                              | Oxfordshire                  |
|                              | 51°37’N, 1°09’W              |
|                              | Jealott’s Hill farm          |
|                              | Berkshire                    |
|                              | 51°27’N, 0°44’W              |
|                              | University of Reading        |
|                              | Berkshire                    |
|                              | 51°44’4”N, 0°41’8”W          |
|                              | Sonning farm                 |
|                              | Berkshire                    |
|                              | 51°28’N, 0°53’W              |
| Data accessibility           | Mendeley data [6]            |
| Published: 30 Aug 2019       | Version 1                    |
|                              | https://doi.org/10.17632/kpcgkfmpv8.1 |
| Related research article     | Author’s names: Luke C. Evans, Richard M. Sibly, Pernille Thorbek, Ian Sims, Tom H. Oliver and Richard J. Walters |
|                              | Title: Quantifying the effectiveness of agri-environment schemes for a grassland butterfly using individual-based models. |
|                              | Journal: Ecological modelling 411, 108798. |
|                              | DOI: 10.1016/J.ECOLMODEL.2019.108798 |

### Value of the Data

- The data consist of a large number of high-accuracy movement and behavioural observations of four species of grassland butterfly. Movement was recorded across a range of weather conditions and at sites of varying in resource density. The data are useful for analyses of the behaviour and/or movement of butterflies.
- The dataset is particularly useful for understanding how the movement of butterflies is affected by varying weather conditions or habitat quality.
- The data can be used to parameterise random-walk movement models as movement was recorded as step distances and turning angles using standard methods.

### 1. Data

The dataset consists of movement and behavioural observations of four species of grassland butterfly measured at four sites in southern England. The data files were deposited in Mendeley data (https://doi.org/10.17632/kpcgkfmpv8.1) and consist of two tables representing 783 unique movement tracks. Data collected in 2016 and 2017 are supplementary to [1] and data from 2017 and 2018 to [2].
2. Experimental design, materials, and methods

2.1. Study sites

The study was conducted at four sites in southern England over the summers of 2016, 2017 and 2018. This sites were North farm in Oxfordshire (51°37'N, 1°09'W), Jealott’s Hill farm Berkshire (51°27'N, 0°44'W), the University of Reading Berkshire (51.4414° N, 0.9418° W), and Sonning farm Berkshire (51°28'N, 0°53'W). The farm sites were agricultural areas where agri-environment schemes had been implemented and consisted of a mixture of arable fields, open meadows, and nectar-rich field margins. The sites at the University were selected as a comparison between flower-rich and flower-poor, two areas were mown short turf grasslands with minimal flowering plants and the other areas were meadow grasslands containing a variety of grass species and wildflowers predominantly the common knapweed (*Centaurea nigra* Linnaeus).

2.2. Materials and methods

Individual butterflies were recorded opportunistically in the field between the hours of 10:00 and 16:00. Butterflies were followed at a distance from the recorder of approximately 3 m for up to 10 minutes. During this period, the position of each individual was recorded by planting a sequentially numbered marker flag, either at each landing site or after every 15 seconds during continuous flight, following established methodology [4,5]. The precise location of each flag was then mapped using a high-grade Global Navigation Satellite System receiver (Arrow 200 RTK) accurate to < 30cm. Observations were stopped early either if the butterfly could no longer be tracked (i.e. crossed hedges or lost from sight) or if a maximum number flags were used. A maximum of 20 flags was used in 2016 and 2017, and 15 flags in 2018. During the observations activity was recorded continuously by categorising behaviour into flying, nectaring (taking nectar from flowers), basking (open wings and stationary), inactive (closed wing and stationary), and oviposition [5].

Dataloggers (HOBO pendant) were used to record solar radiation (lux) at 10-s intervals and the air temperature was measured at hourly intervals from meteorological stations within 3km the sites (Jealott’s Hill, Sonning, University of Reading, RAF Benson). The dataloggers measure a broad spectrum of light wavelengths and are most effective at measuring the relative light intensity.

2.3. Data processing

Records of precise location, time and behaviour were processed to calculate the distance between successive flags, referred to as a step distances, and the angle subtended between consecutive flags, referred to as turning angles. The data is collated into two tables. The first, from the summer of 2016, is organised such that each row refers to a unique flag with step distance to the flag, the turning angle and the amount of time the butterfly remained stationary recorded on a single row. Behaviours performed by the butterfly were then recorded together in a single cell. In the second dataset, from the summers of 2017 and 2018, step distances and turning angles were as in 2016, but each row refers to a separate behaviour so that multiple rows record behaviours at the same position. This allowed a simpler analysis of the sequence and duration of behaviours. In addition, both datasets contain information on the year, day of the year, species, sex, solar radiation, air temperature, location and site quality (nectar-poor or nectar-rich) of an observation.

Acknowledgments

L. Evans was supported by a BBSRC CASE (BB/N504129/1)/Syngenta PhD studentship award. Access to sites was granted by the Earth trust, The University of Reading and Jealott’s hill Syngenta. We are grateful to additional research assistance in the field provided by undergraduate students: Andrew Tarbie, Felix Townsend, Ginny Crouch and Arron Watson.
Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

[1] L.C. Evans, R.M. Sibly, P. Thorbek, I. Sims, T.H. Oliver, R.J. Walters, Integrating the influence of weather into mechanistic models of butterfly movement, Mov. Ecol. 7 (2019) 24, https://doi.org/10.1186/s40462-019-0171-7.

[2] L.C. Evans, R.M. Sibly, P. Thorbek, I. Sims, T.H. Oliver, R.J. Walters, Quantifying the effectiveness of agri-environment schemes for a grassland butterfly using individual-based models, Ecol. Model. 411 (2019), https://doi.org/10.1016/j.ecolmodel.2019.108798.

[3] P. Turchin, Translating foraging movements in heterogeneous environments into the spatial distribution of foragers, Ecology 72 (1991) 1253–1266, https://doi.org/10.2307/1941099.

[4] C.B. Schultz, Dispersal behavior and its implications for reserve design in a rare Oregon butterfly, Conserv. Biol. 12 (1998) 284–292, https://doi.org/10.1046/j.1523-1739.1998.96266.x.

[5] J.W. Dover, A method for recording and transcribing observations of butterfly behaviour, Entomol. Gaz. 40 (1989) 95–100.

[6] L.C. Evans, R.M. Sibly, P. Thorbek, I. Sims, T.H. Oliver, R.J. Walters, Data on the movement behaviour of four species of grassland butterfly, Mendeley Data (2019) V1, https://doi.org/10.17632/kpcgkfmpv8.1.