eBMS 15-minute counts and transects

Emily Dennis

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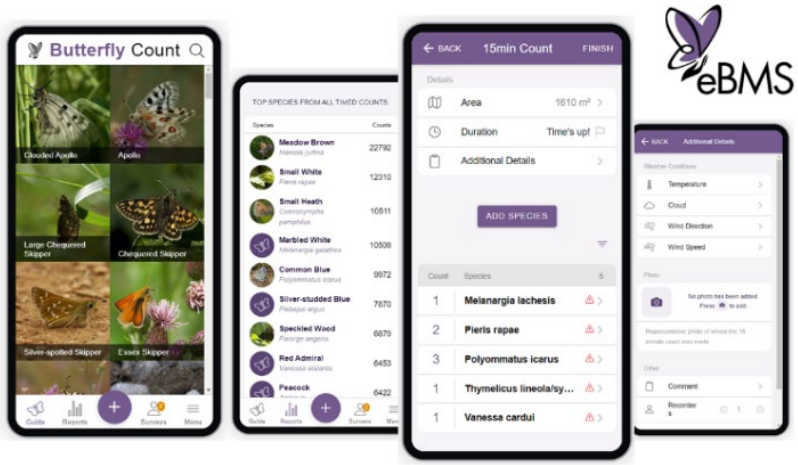
Butterfly Conservation

eBMS 15-minute counts

- Flexible
- Anywhere, anytime
- Standardised – 15 minutes
- Complete lists with counts
- Georeferenced observations
  - route, area or point



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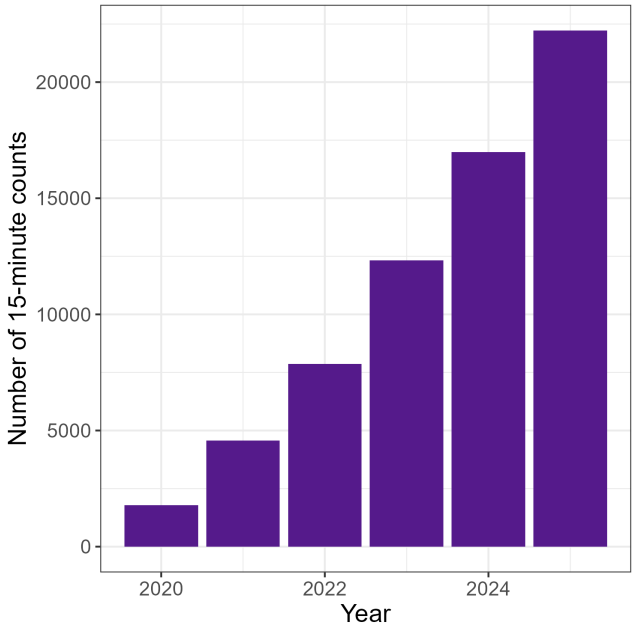
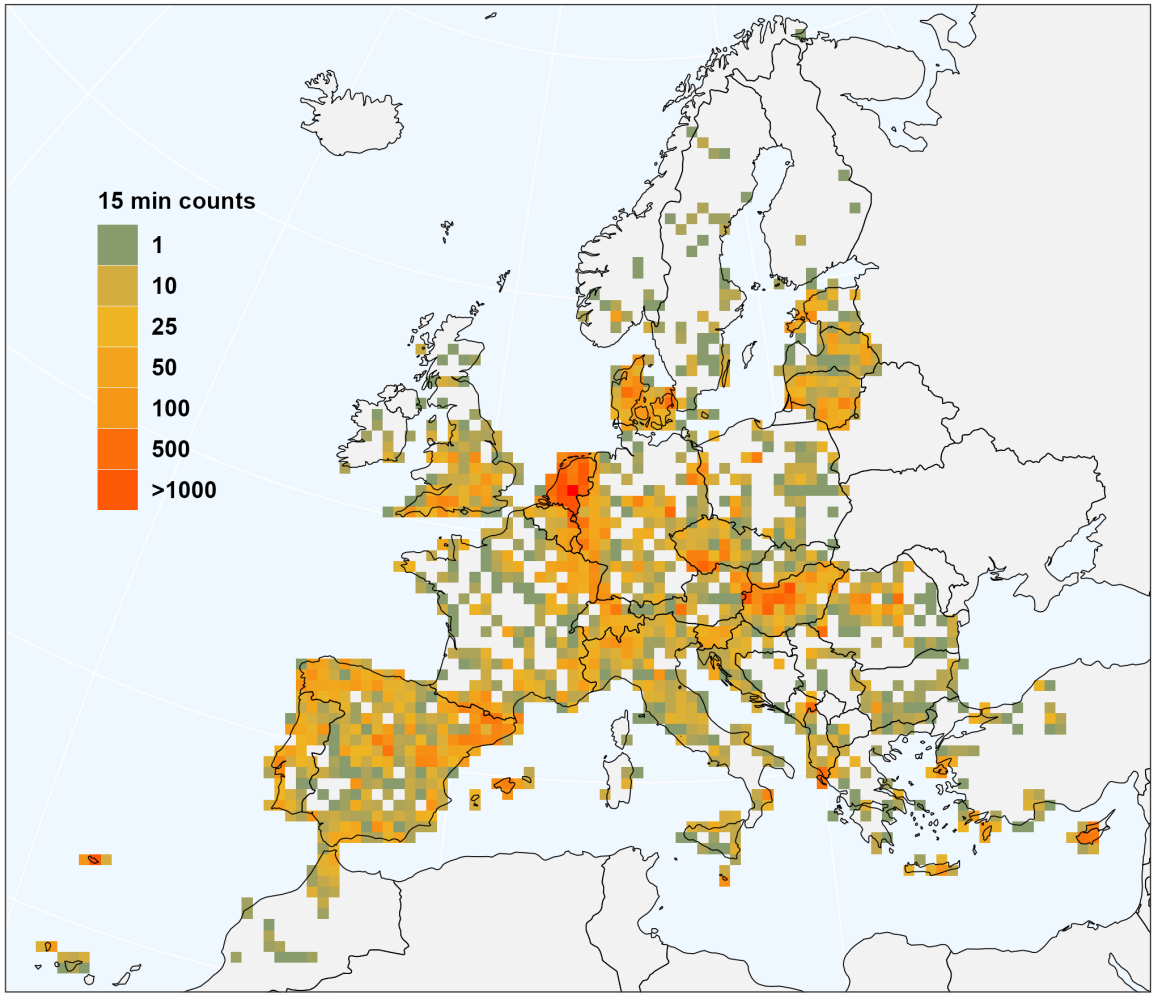
eBMS 15-minute counts





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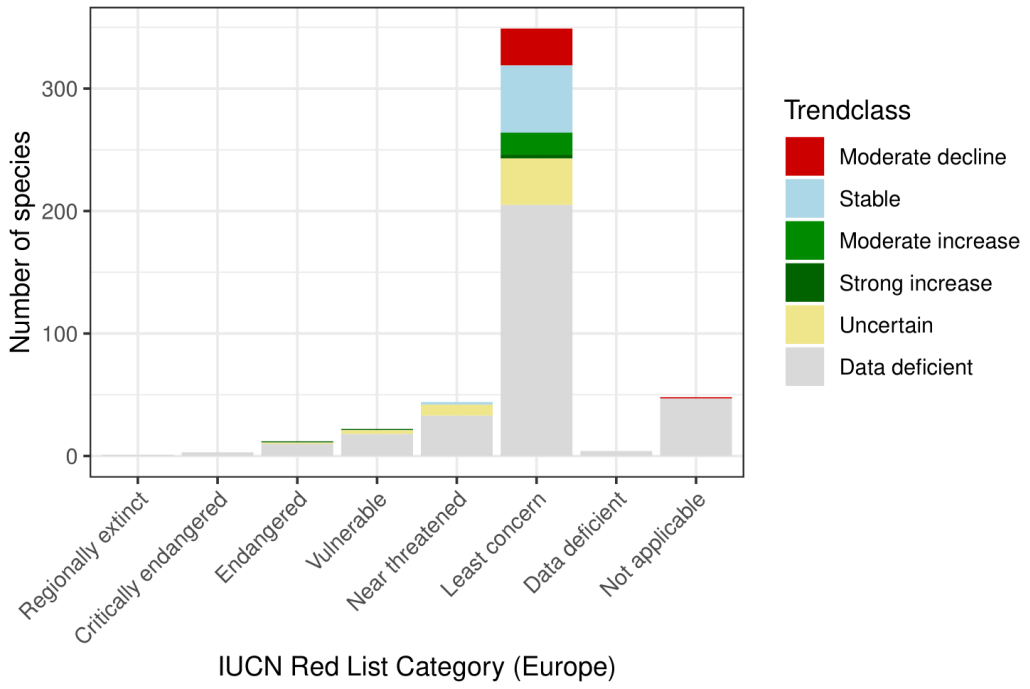
How can 15-min counts support transects?

Potential for gap filling

- Under-represented (rare) species
- Under-represented areas
    - Remote, mountainous
    - Agricultural, urban



Number of species with trends per IUCN Red List category. Trends have been calculated for 167 (35%) of the 483 butterfly species in Europe.

Transects vs 15-minute counts

	eBMS transects	15-min counts
Complete list of species sampled	✓	✓
Sampling effort recorded	✓	✓
Abundance (count) data	✓	✓
Repeated throughout the season	✓	?
Repeat samples from the same location	✓	?
Flight curve estimation	✓	?
Trend estimation	✓	?

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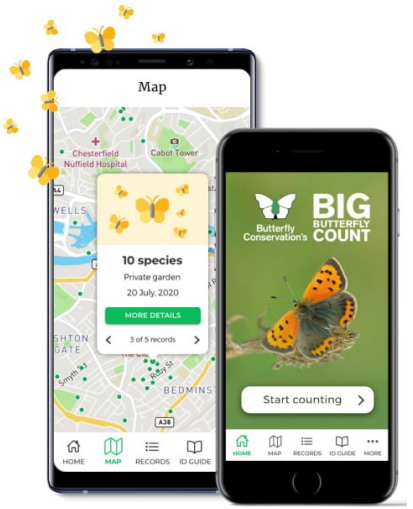
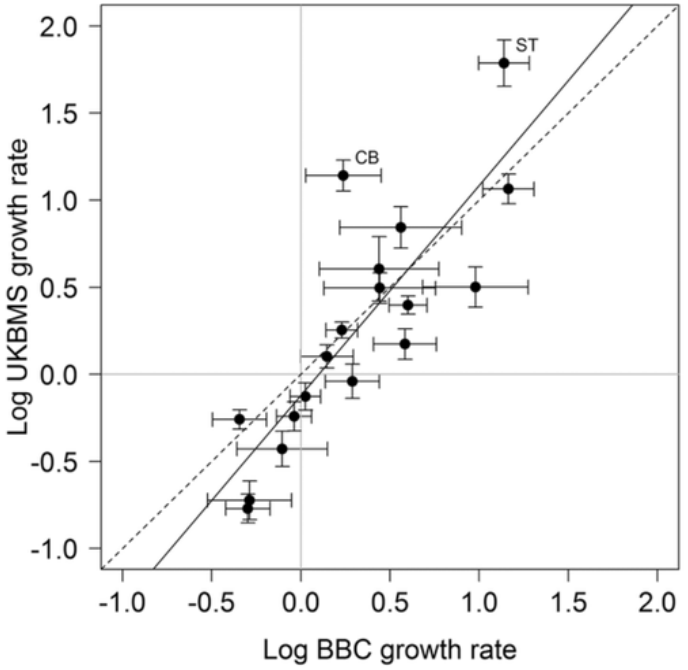
Big Butterfly Count in the UK

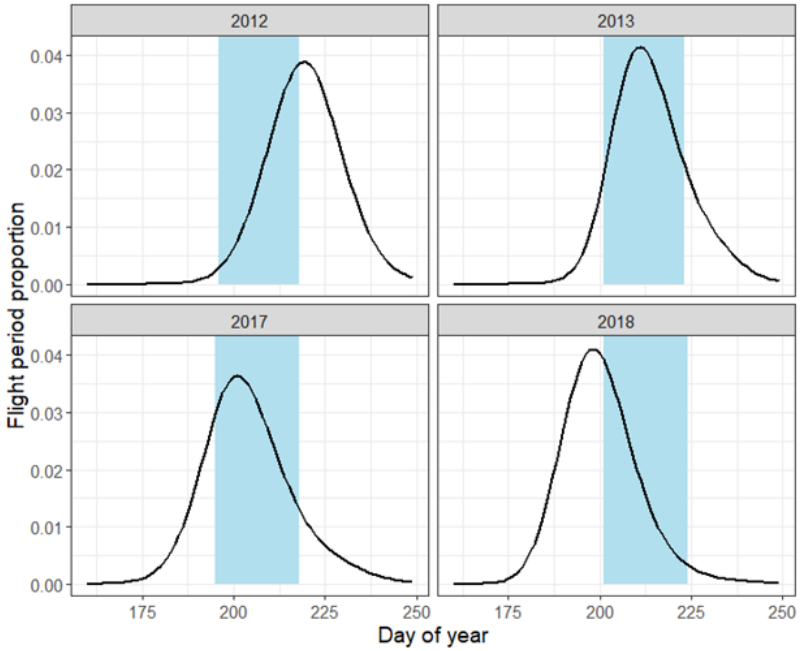
- 3 weeks in July/August since 2010
- >125,000 citizen scientists in 2025
- Mostly gardens
- For common species 15-min counts and transects can produce similar abundance trends





Dennis et al. (2017) Using citizen science butterfly counts to predict species population trends. *Con. Bio.* https://doi.org/10.1111/cobi.12956

Big Butterfly Count in the UK

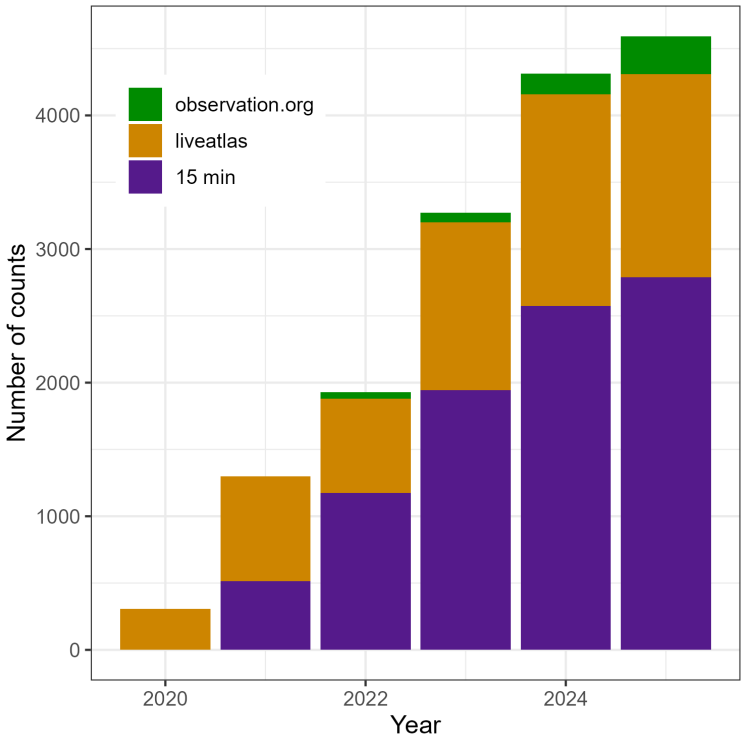


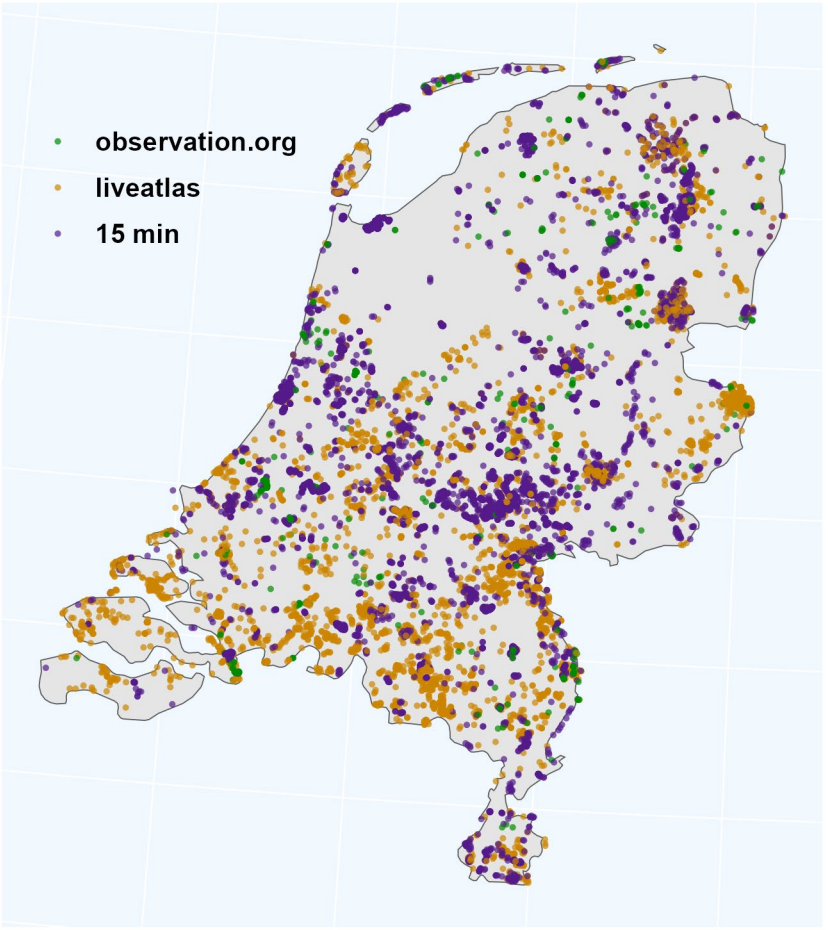
Gatekeeper *Pyronia tithonus*

- Account for phenology
- Adapt method to allow multiple counts for a given site and visit (day)
- BBC sampling has sufficient power to detect a decline of 25% over 12 years

Dennis et al. (2024) Incorporating Phenology to Estimate Species' Population Trends from Snapshot Citizen-Science Data. *JABES*. https://doi.org/10.1007/s13253-024-00669-z

Flex counts in the Netherlands





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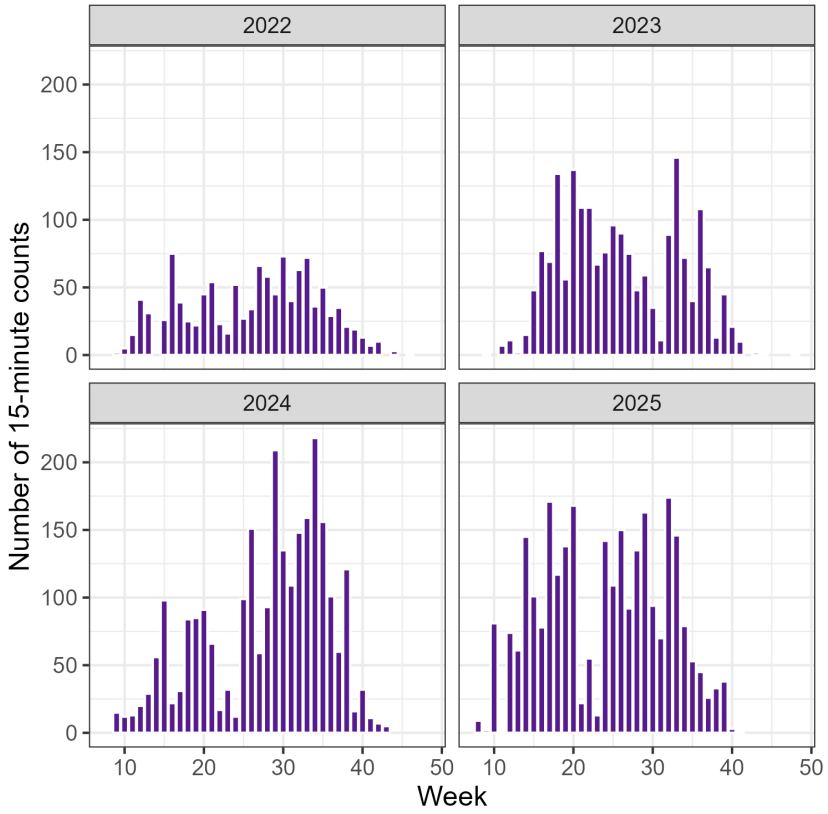
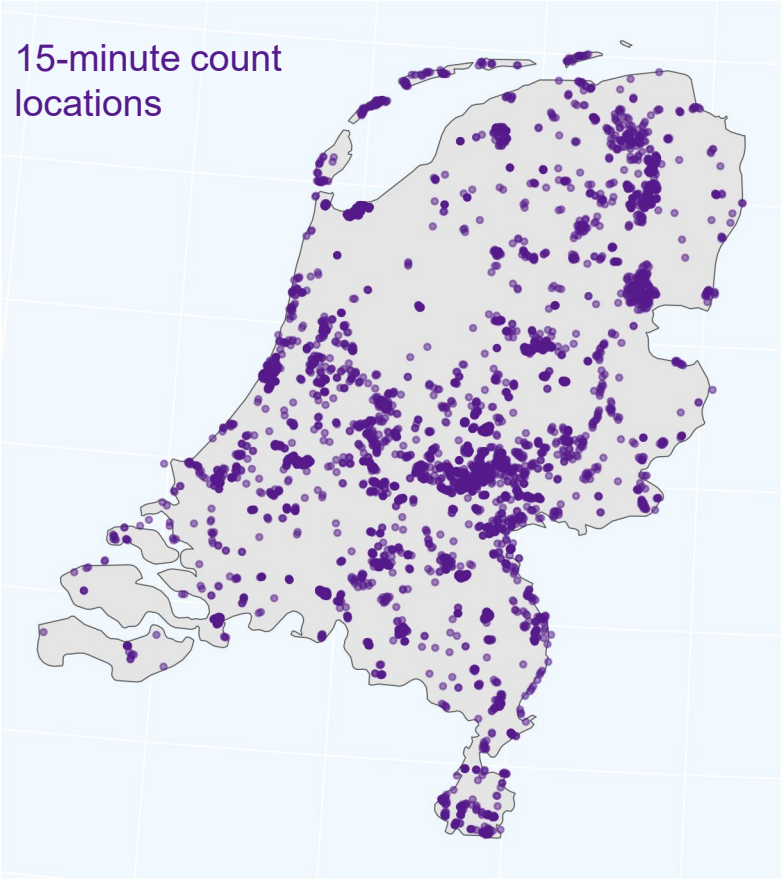
15-min counts in the Netherlands





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Can we estimate flight curves/trends from 15-minute counts?

- Define 15-min “site” by grid of varying size
- using rbms:
  1. Calculate annual flight curves
  2. Calculate annual site abundance indices
  3. Calculate collated (abundance) indices
- Common species – comparison with transects

https://github.com/RetoSchmucki/rbms

Methods in Ecology and Evolution

Methods in Ecology and Evolution 2013, **4**, 637–645 doi: 10.1111/2041-210X.12053

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

Emily B. Dennis[1,2]*, Stephen N. Freeman[2], Tom Brereton[3] and David B. Roy[2]

[1]National Centre for Statistical Ecology, School of Mathematics, Statistics and Actuarial Science, University of Kent, Canterbury, Kent, CT2 7NF, UK; [2]NERC Centre for Ecology & Hydrology, Maclean Building, Benson Lane, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB, UK; and [3]Butterfly Conservation, Manor Yard, East Lulworth, Wareham, Dorset, BH20 5QP, UK

Butterfly Conservation

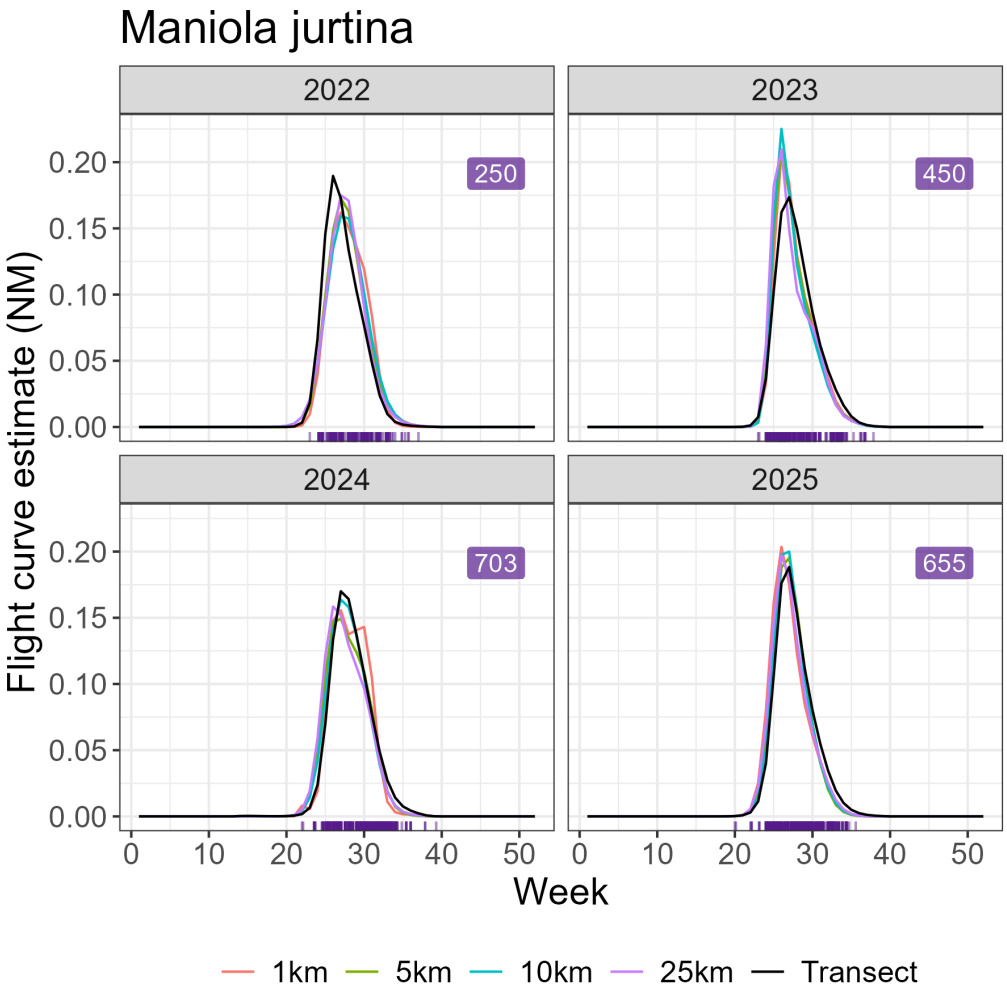
Journal of Applied Ecology

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], Tom M. Brereton[16], Alexander Harpke[14], Janne Heliölä[10], Elisabeth Kühn[14] and Romain Julliard[1]

Flight curves from 15-min and transects



2022-2025:
2058 15-min counts
1282 transects

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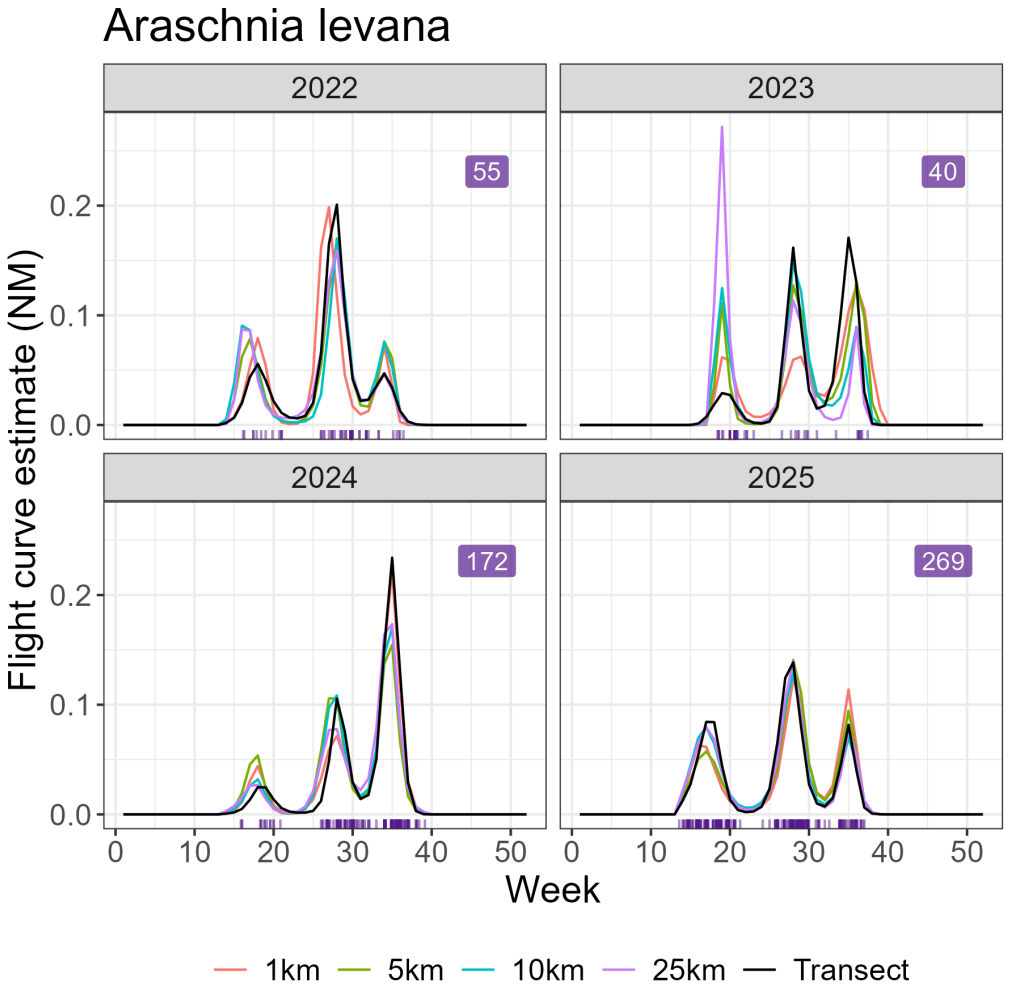
Flight curves from 15-min and transects



2022-2025:
536 15-min counts
783 transects

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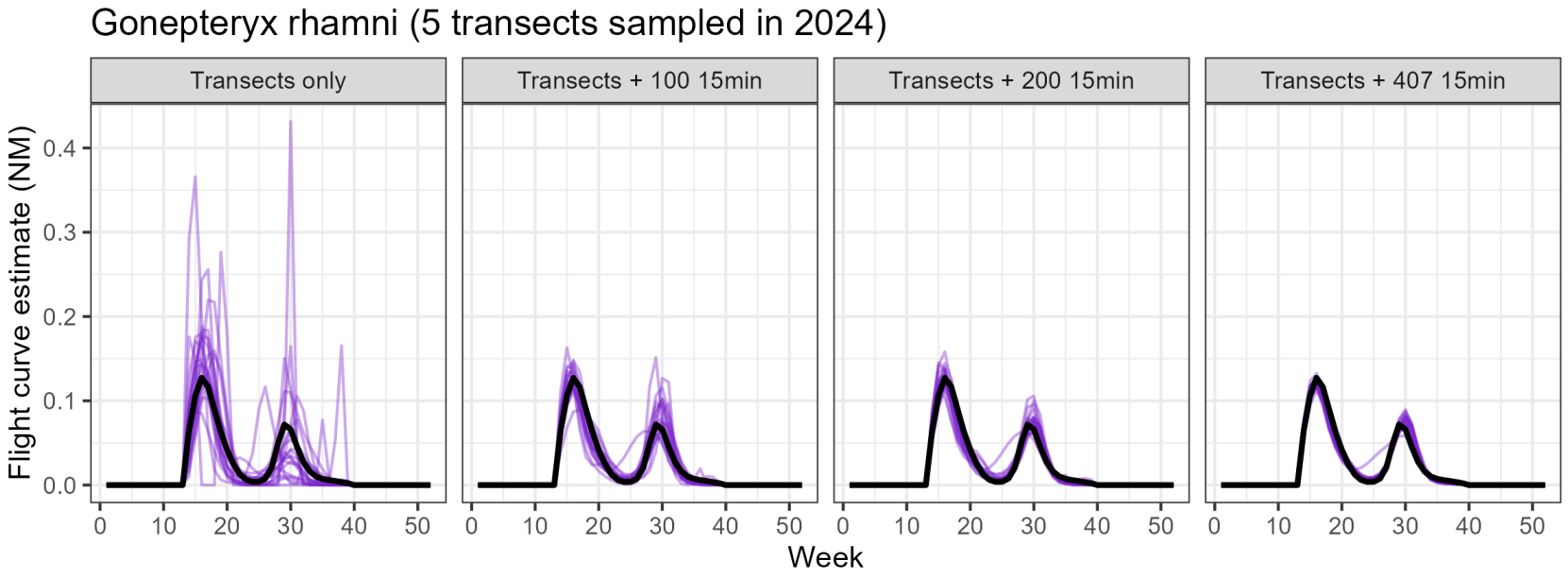
Degradation example – estimating phenology

- Can 15-min counts improved flight curve estimation when transect sampling is low?
- Simulated scenarios where only 5 transects were sampled
- Supplemented with increasing numbers of 15-min counts
- 20 iterations



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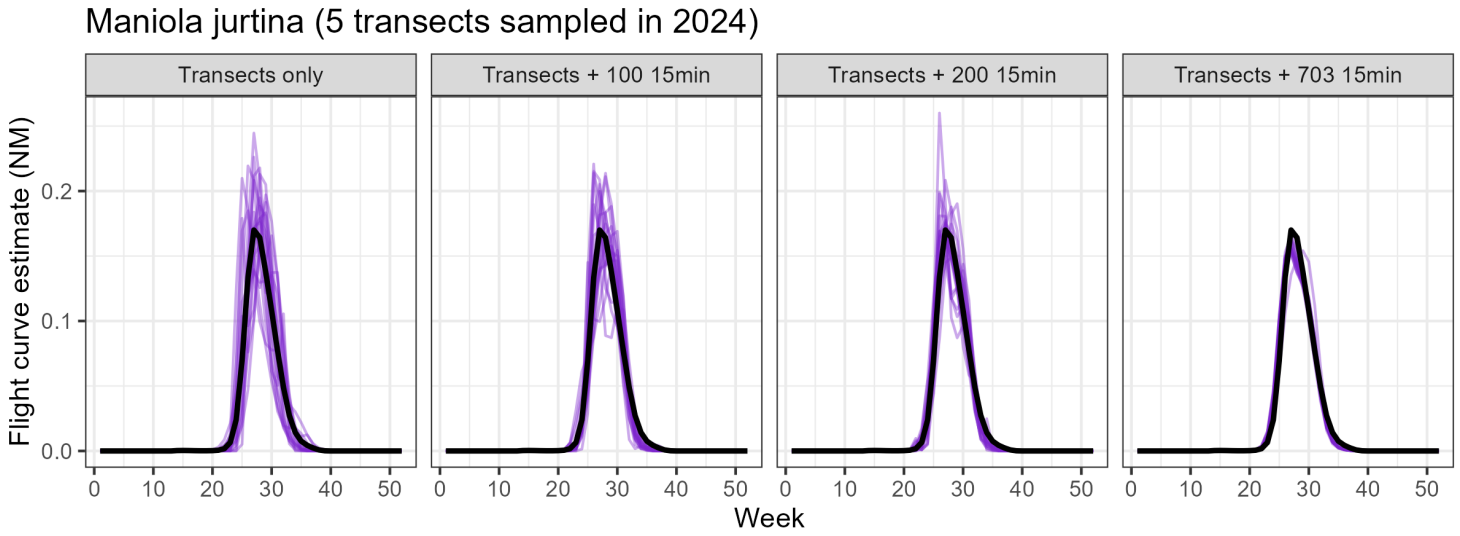
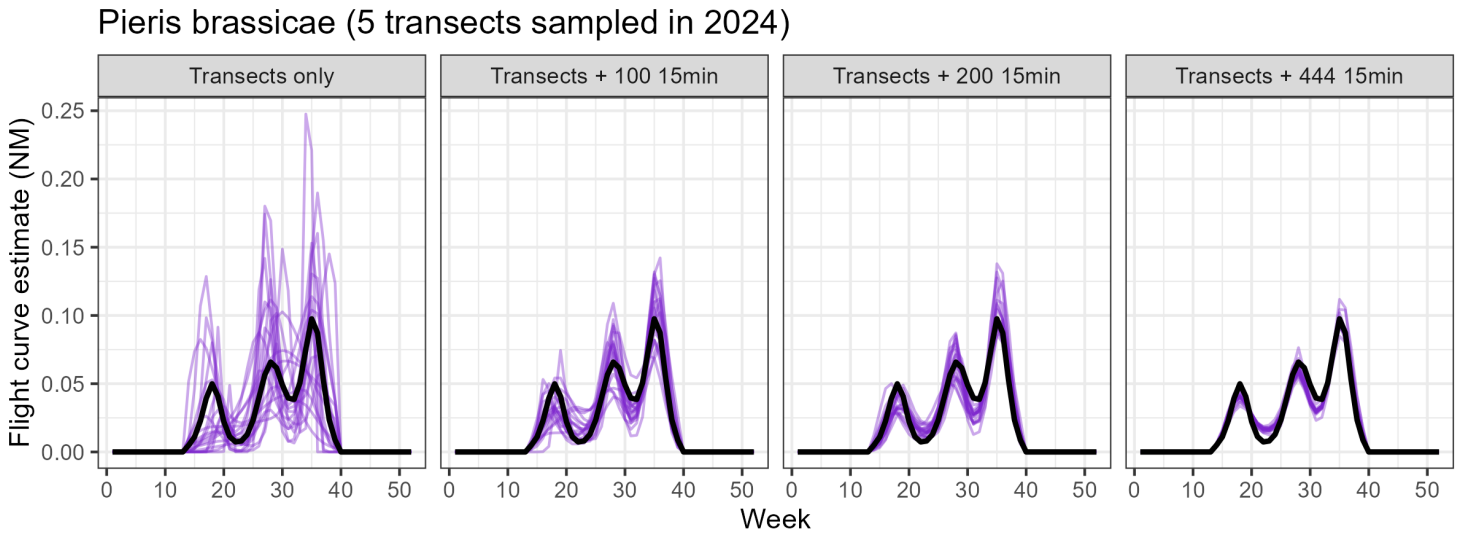
Degradation example – estimating phenology





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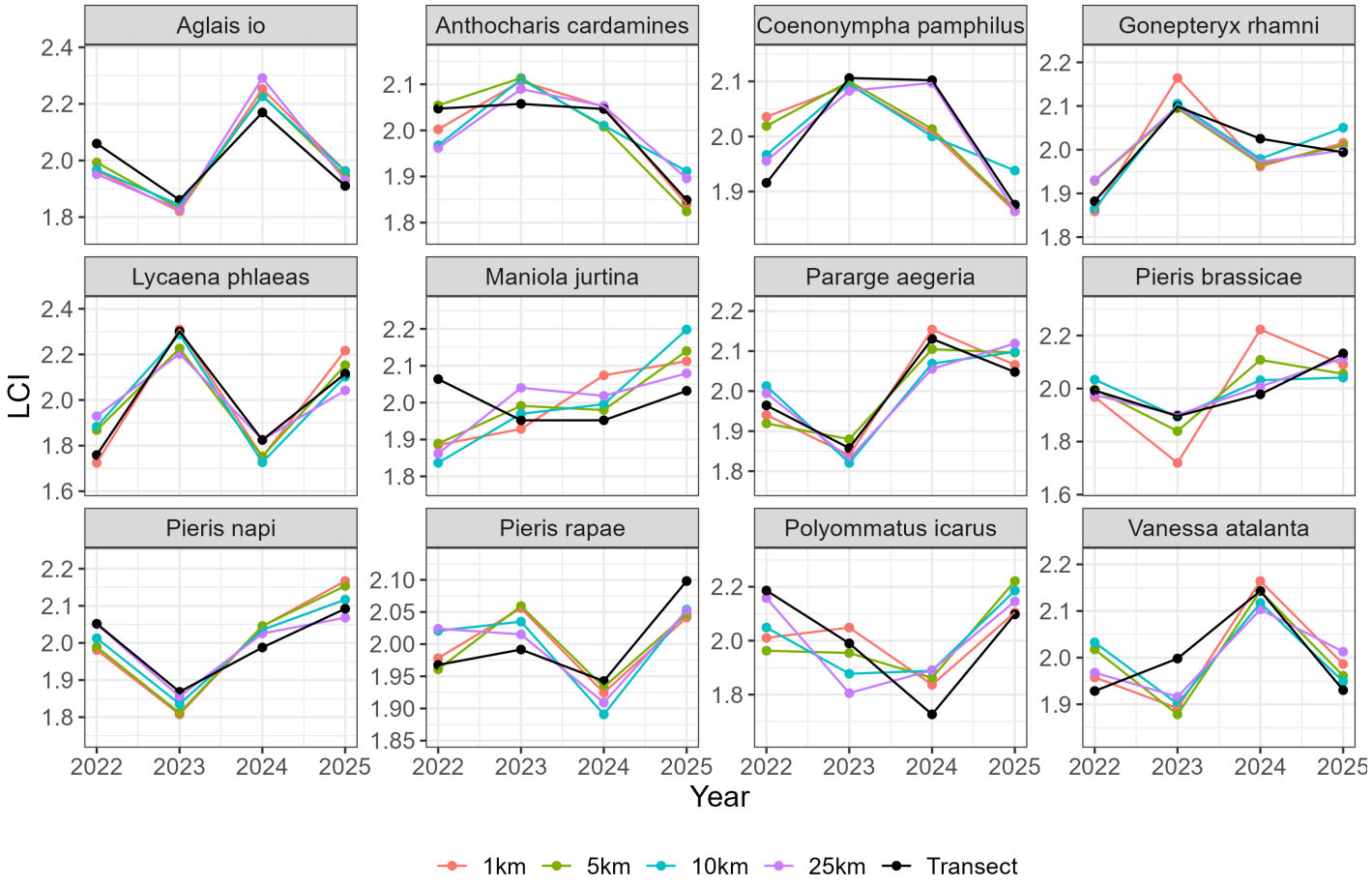
Estimating abundance indices from 15-min counts

- Species with > 100 15-min counts in NL each year
- Warning – exploratory results based upon only 4 years



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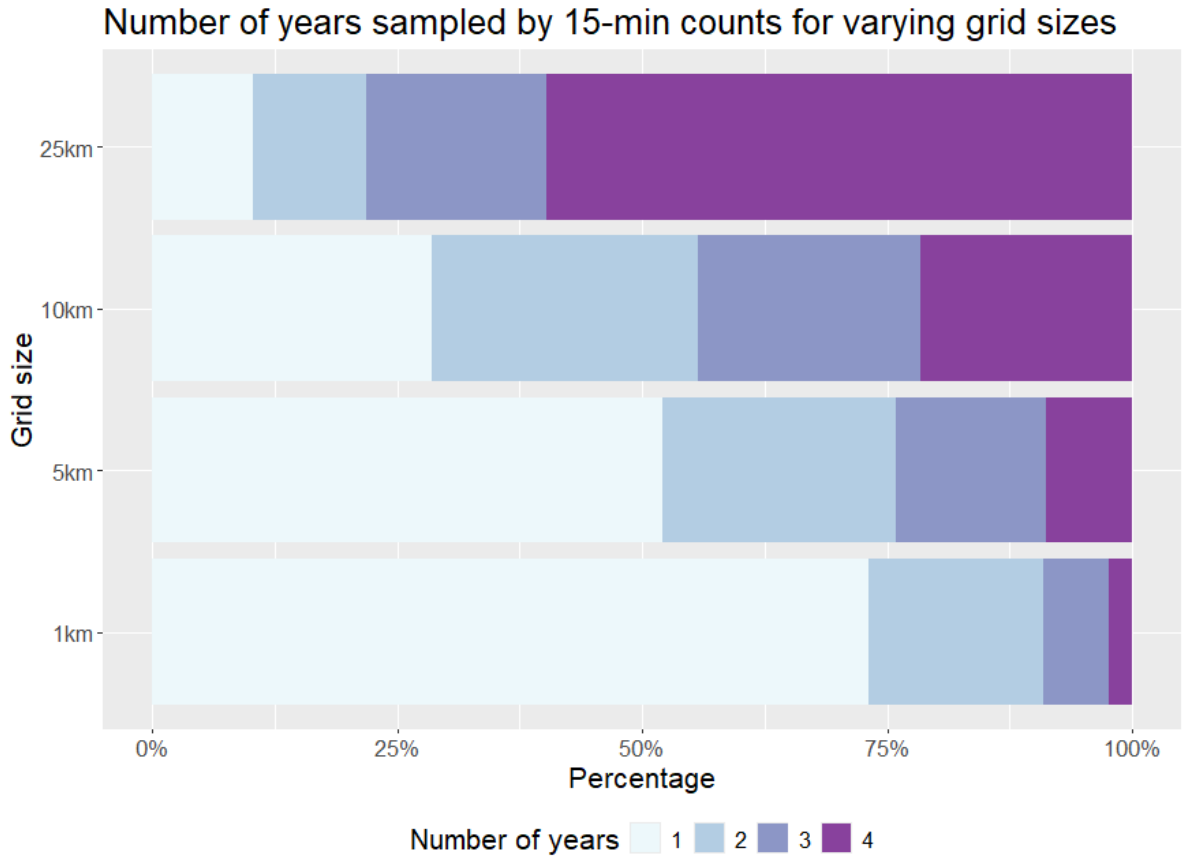
Are 15-min locations resampled across years?



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Summary and questions

- With sufficient sampling, 15-min counts have the potential to contribute to flight curve and abundance trend estimation
- To consider
  - Site definition - projects
  - Density estimation
  - Calculation of combined abundance trends
  - How to optimally distribute effort over time/space?
- Transects remain the gold-standard
  - 15-min counts may complement
- Potential for gap filling – targeted monitoring
  - Under-represented (rare) species
  - Under-represented areas
- Flexibility, but encourage resampling of locations
- Keen to hear about examples of 15-minute count usage in Europe

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Thank you

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Thank you to everyone undertaking butterfly monitoring across Europe.

EMBRACE project: EC-ENV/2024/NP/0040: GRASSLAND BUTTERFLY INDICATOR AND EUROPEAN BUTTERFLY MONITORING SCHEME UPDATE (2021-2026)