
Review of 2008-2023 GMS Winter Scheme data

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Steve Roberts, Centre for Biostatistics, University of Manchester

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Feedback

Comments and feedback welcome to steve.roberts@manchester.ac.uk or SteveRoberts@live.co.uk

2 Background

This document aims to provide a summary of what data is available from the GMS Winter scheme, with a particular focus on which species have sufficient data for a reliable analysis of trends. The purpose is to inform subsequent analysis of the data.

- Descriptive statistics and plots summarising aspects of the data
- Plots to check for data issues and characteristics that will determine the analysis

3 Dataset Description

This report is based on 2 datasets:

- All records from the main winter scheme (winter.Rd)
- An augmented dataset (winterPlus.Rd) - all data from traps participating in the winter scheme in each year (ie including the previous summer)

Details of the inclusion/exclusion criteria and cleaning etc in the “About the GMS data” Word document.

Numbers in each dataset are given in [Table 1](#) below:

Table 1: Dataset Characteristics

	Winter Data	Expanded dataset
Records	33,580	174,088
Gardens	378	378
Traps	538	538
Moths	41,083	633,438
Species	79	80
Start Year	2008	2008
End Year (GMS season)	2023	2023
TrapYears	1467	1467
Nights	22,151	60,306
Empty Traps	13,373 (60.4%)	20,170 (33.4%)
Missed Weeks	1,321 (5.6%)	15,978 (20.9%)

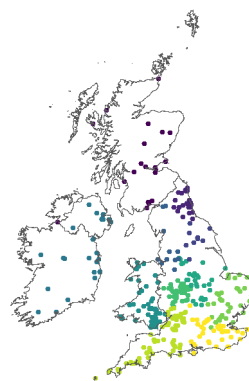
Note that the missed weeks for augmented dataset looks odd - it seems there are a substantial number of traps which recorded in the winter, but not in the previous summer - this seems to be real due to recorders switching traps for the winter scheme.

3.1 Trap Locations

For all in winter scheme

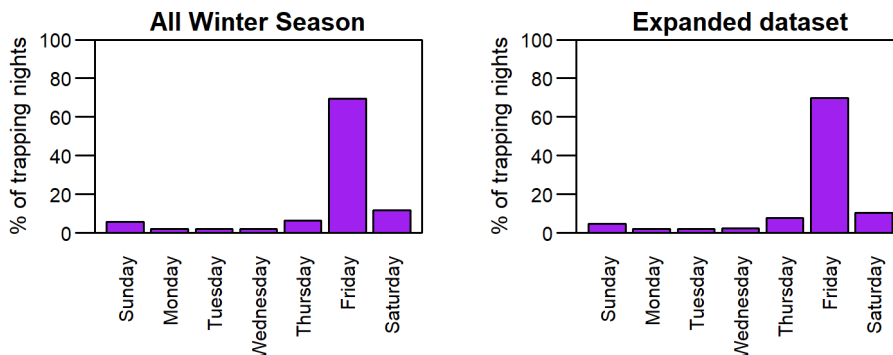
Figure 1: Trap locations

All Winter scheme



3.2 Recording Day

Figure 2: Day of week traps were run

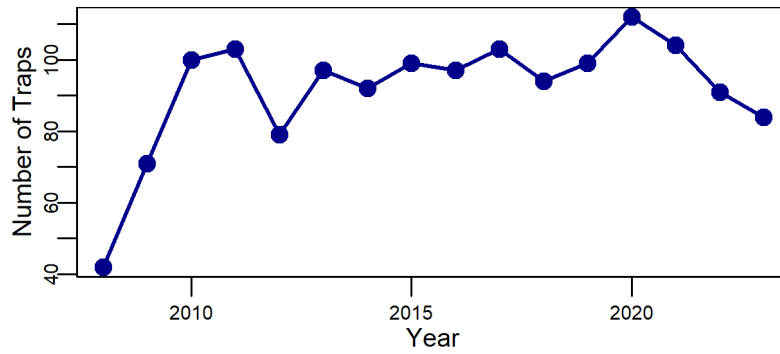


- 69.4% recorded on Friday night (winter scheme dataset)

- 69.9% recorded on Friday night (expanded dataset)
- (Note some recorders choose a different day than Friday - may be worth looking at deviations from some definition (mode?) of usual day for each trap)

3.3 Traps per year

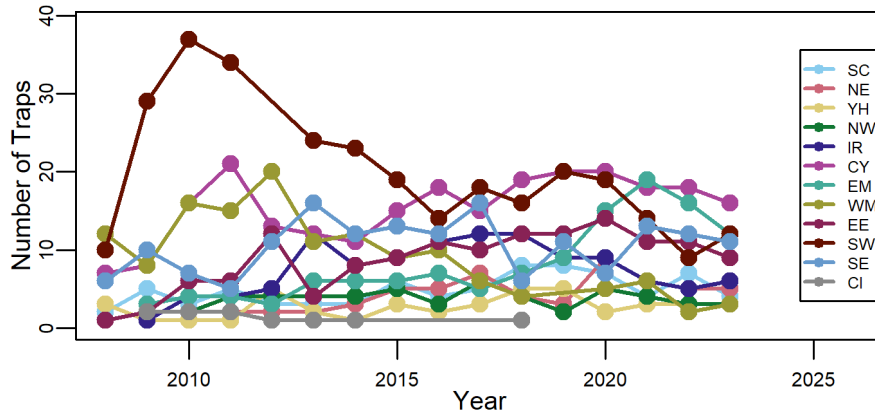
Figure 3: Number of traps recording each year



- Around 100 traps from 2010 onwards
- Note numbers falling off in recent years!

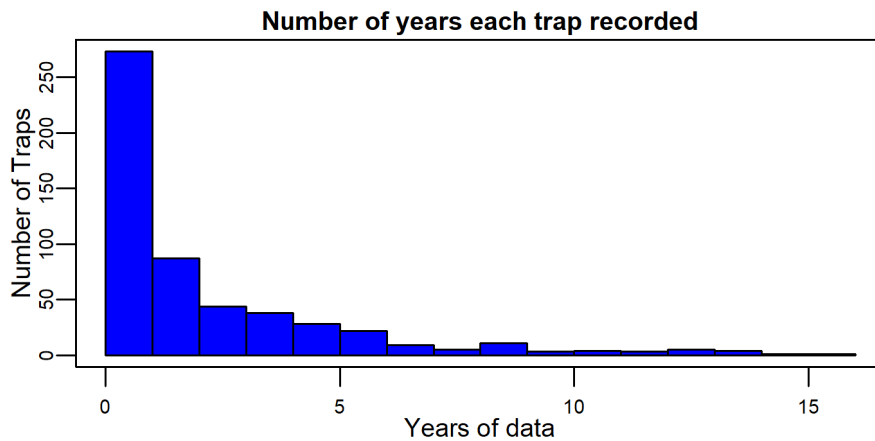
And by region...

Figure 4: Number of traps recording each year (All winter scheme)



3.4 Length of recording

Figure 5: Number of years each trap recorded (main winter dataset)



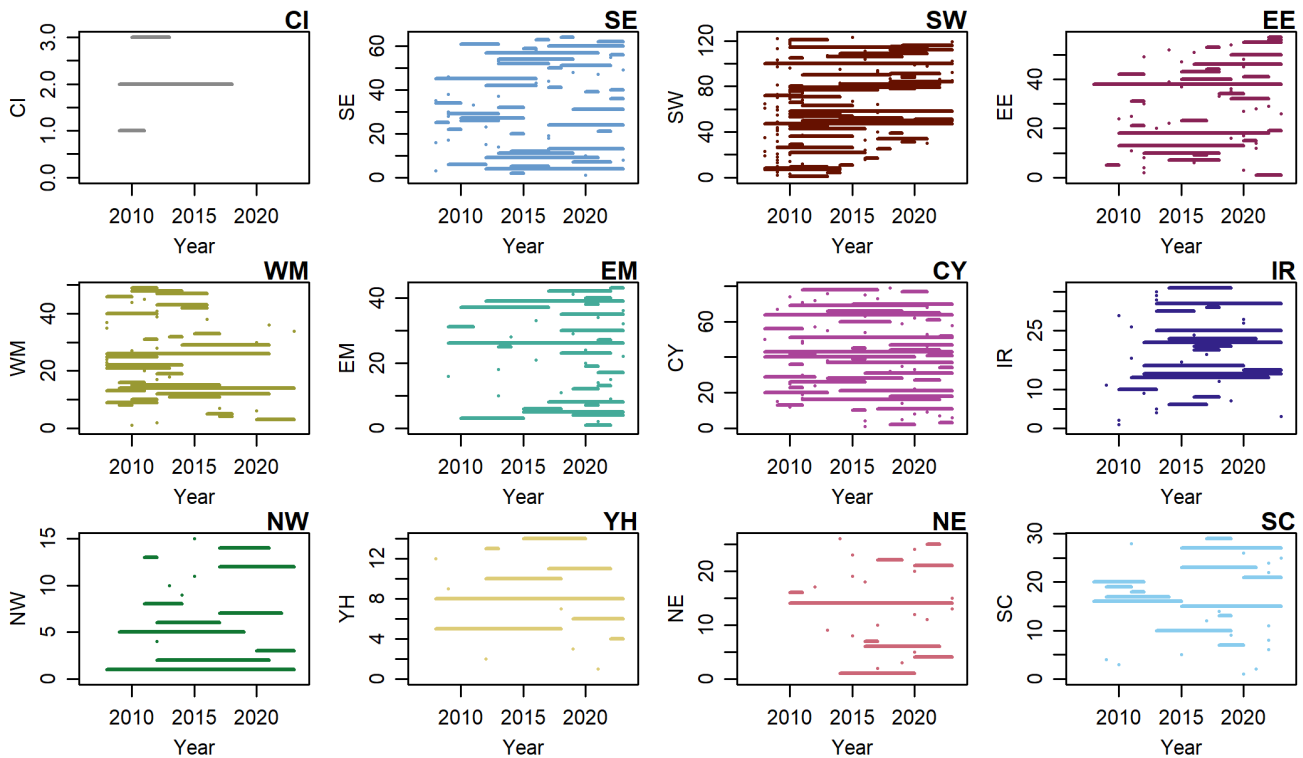
273 (51%) traps with only 1 years recording
 265 Traps with 2 or more years
 360 (67%) traps with only 1 or 2 years recording
 178 Traps with 3 or more years
 96 Traps with 5 or more years

- For trend analysis only those with 2 years or more recording provide any useful information
 - Currently using a minimum of 3 years for the trend analysis subset

3.5 Patterns of recording

Here I plot a line showing the time period each trap was active. Separate panels for each region. Plotted in roughly South to North order. Each horizontal line represents one trap with the line extending over the range of years that trap was in the scheme. This illustrates that there are very few traps with data for the whole period and that trends over time will have to be derived by piecing together many shorter-term trends. It is also apparent that some regions were rather later getting started so care will be needed in interpreting trends as the regional coverage varies over time.

Figure 6: Duration of recording for each trap by region (trend dataset)



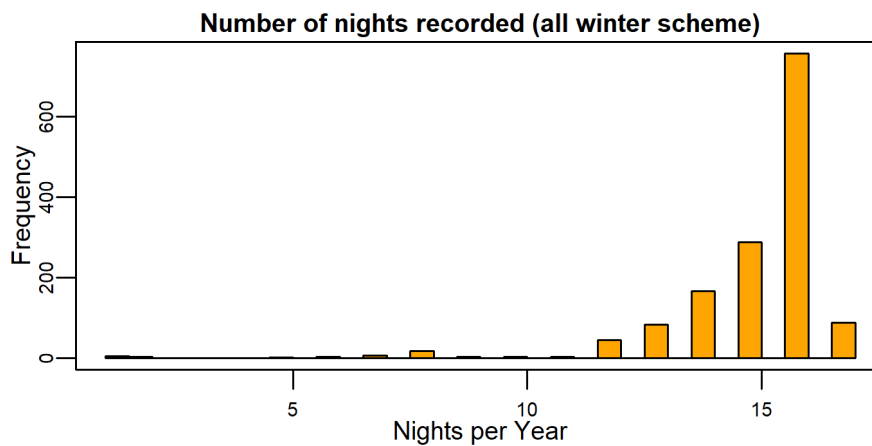
- CI really doesn't have the coverage for meaningful analysis - dropped.
- Ireland a bit slow starting and nothing for 2008.
- Northern England and Scotland are rather patchy.
- Quite a few only try the winter scheme once!

Once we start to look regionally, the coverage is not great and different time periods have different contributions from different regions. This will need to be considered in the analysis and interpretation.

3.6 Recording Nights

Plot of the number of nights recorded for each trap/year:

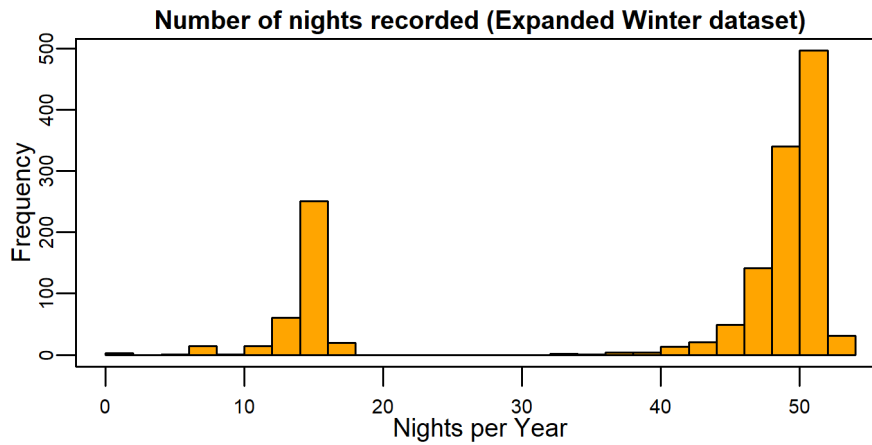
Figure 7: Number of nights recorded (Main season dataset)



- Note: 16 Trap/Years with less than half (<8) nights recording.
- Probably need to exclude these for trend analyses.
- But the vast majority have complete or near complete weeks.

Loong at the expanded dataset:

Figure 8: Number of nights recorded (Main season dataset)

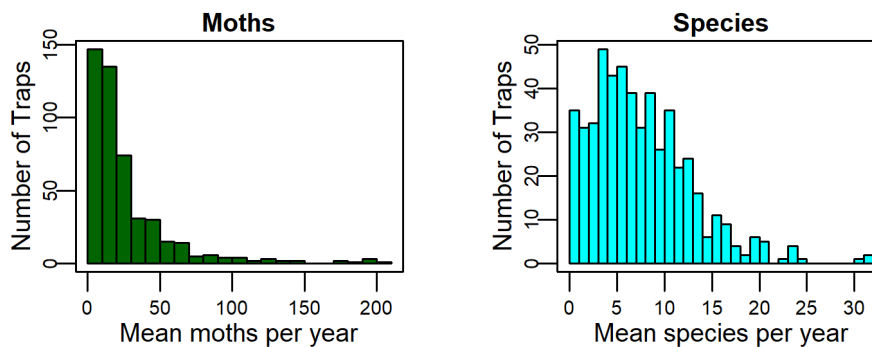


- There are a substantial number of traps that recorded in the winter but did not record in the previous summer. This appears to be recorders who switched traps for the winter scheme and real!

3.7 Moth numbers per trap

Figure 9 shows histograms giving the distributions of the mean number of moths per year and mean number of species on the winter lists recorded across traps. Full winter dataset, excluding those recording <8 nights.

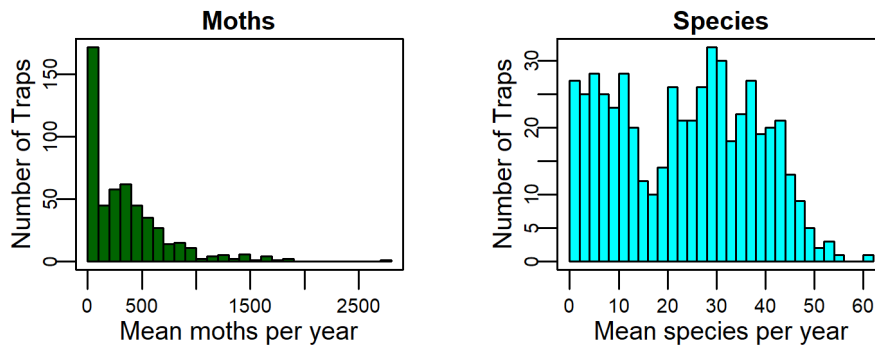
Figure 9: Mean number of moths and species per year for each trap



- Mean moths recorded: 27; Median 16
- Mean species recorded: 8; Median 7
- Range 1 to 202 moths per year.
- Range 0 to 32 species per year.
- Note we have selected traps with reasonably complete coverage (>8w) - low numbers are real!

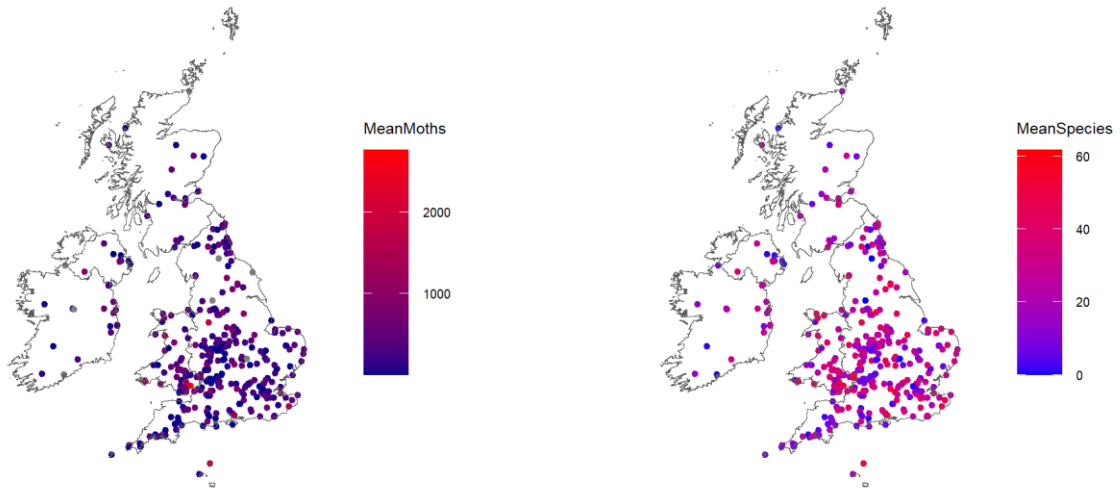
Figure 10 shows histograms giving the distributions of the mean number of moths per year and mean number of species across traps. Expanded winter dataset, excluding those recording <8 nights (over the whole 12m period).

Figure 10: Mean number of moths and species per year for each trap



Plotting the number of moths and species (average per year) by location:

Figure 11: Moth Numbers

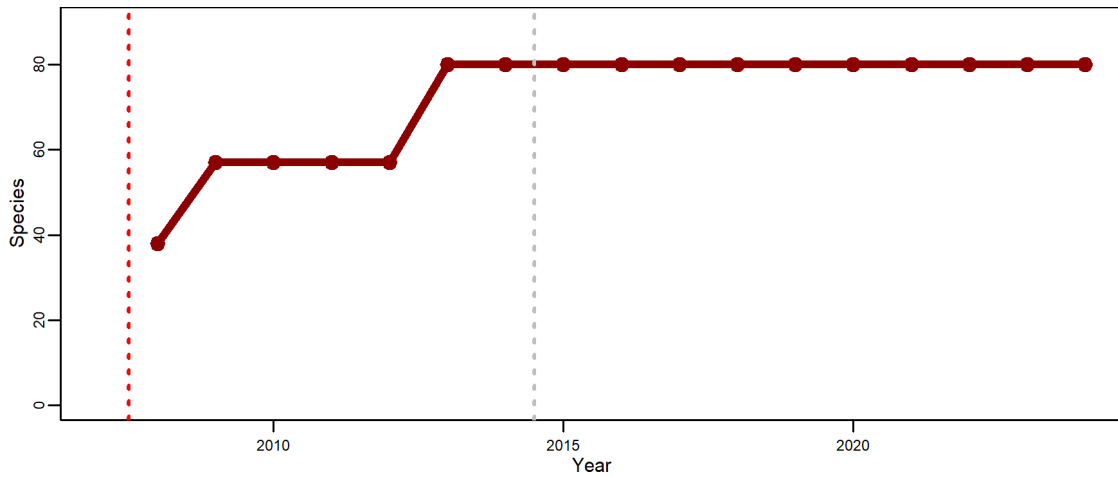


4 Recording forms

The “Winter” sheet in the Excel file SpeciesLists.xlsx documents the species recorded in the winter scheme in each year.

Figure 12 below shows the number of species in each winter form (common form for all regions):

Figure 12: Numbers of species on recording forms

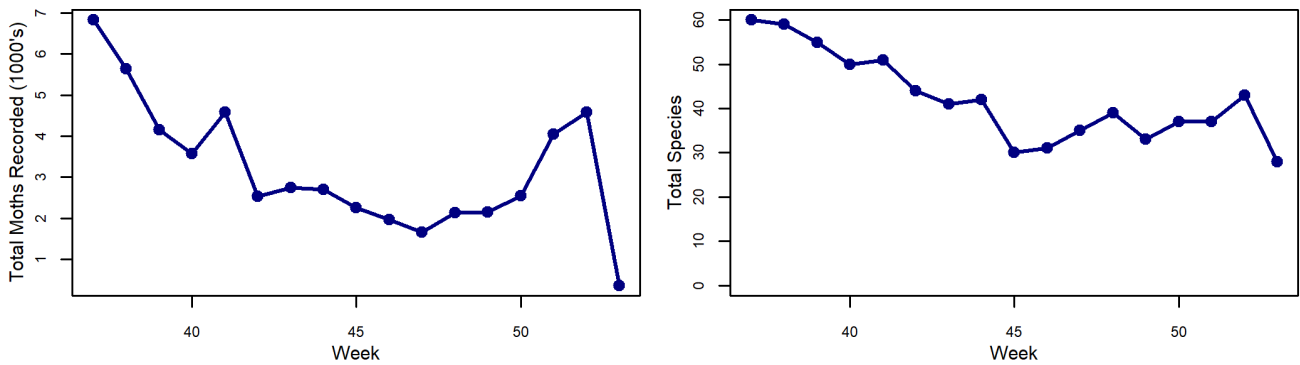


The number of species recorded has doubled over the years from 38 at the start in 2008 to 80 from 2013 onwards.

5 Moths Numbers and Species by week

Total numbers of moths and species recorded in each GMS week in the full winter dataset (week numbers starting from the beginning of the main GMS scheme to the week before the start of the next main season):

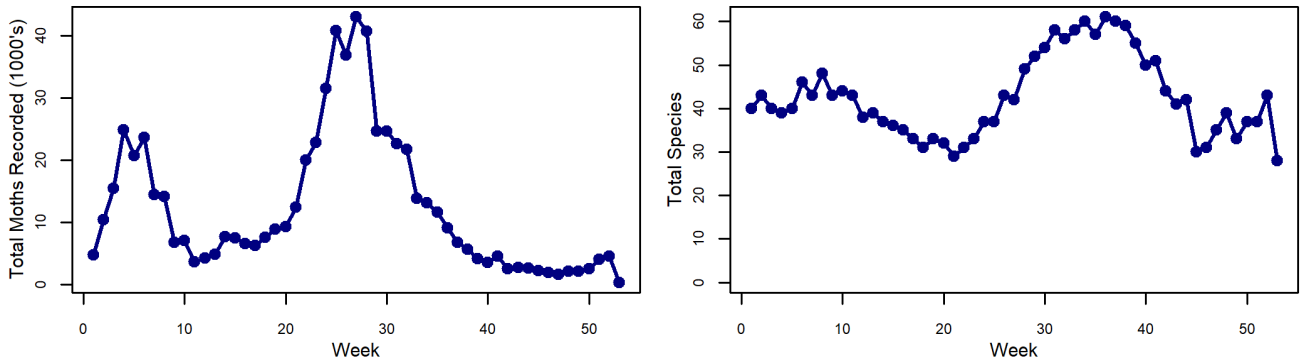
Figure 13: Total numbers of Moths and species recorded by GMS week (winter scheme)



- Note that week 53 only occurs in a few years - most years this is the first week of the next main season.

And for the expanded set (includes only the species on the winter lists):

Figure 14: Total numbers of Moths and species recorded by GMS week (Full year from traps participating in winter scheme)

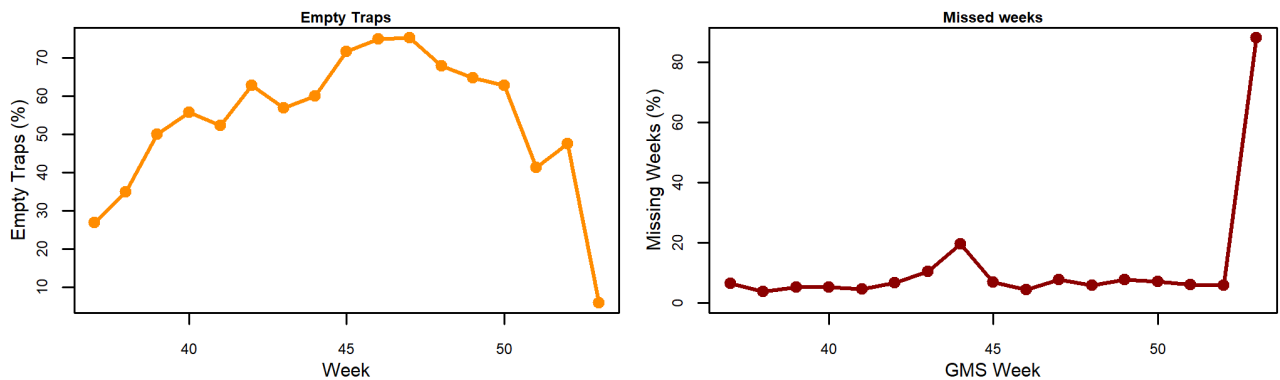


- Note how there are more of the “winter” species in the main season - this is due to common species such as Large Yellow Underwing being on the winter list!

5.1 Empty Traps and missing weeks

(Based on all winter season data)

Figure 15: Empty traps and Missing (traps not run) weeks

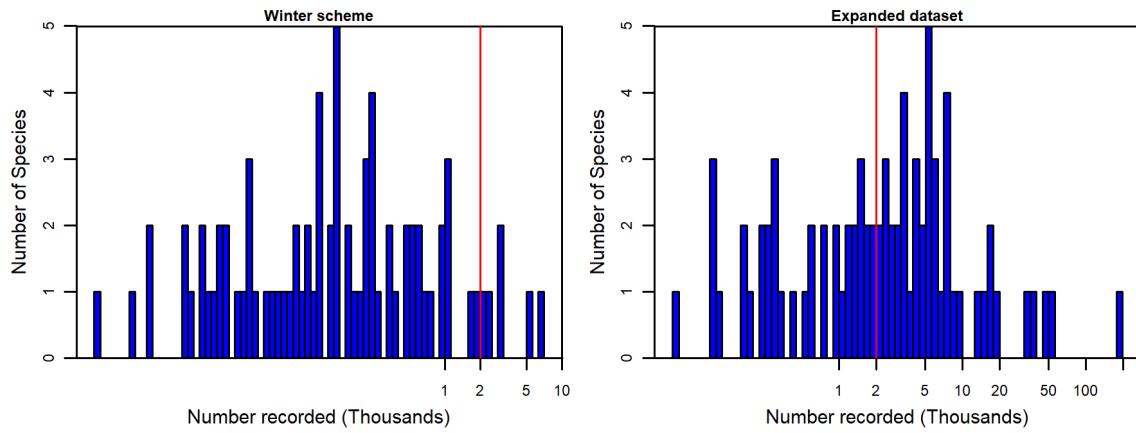


- The majority of traps are empty most of the time!
- Most missing weeks over Christmas
- Ignore week 53 as only happens some years!

6 Numbers of each species

Here are plots of the total number of moths in recorded in the winter dataset and the augmented dataset of winter species in traps participating in the winter scheme, with a line showing the arbitrary 2000 moths as an indicator of the kind of numbers we might need to show trends.

Figure 16: Winter Scheme - Numbers of each species



With the expanded dataset we do have a chance of identifying trends if we include the additional data from these traps in the main scheme. 44/80 winter species have >2000 moths recorded.

These species are listed in [Table 2](#), where we only include species that have been recorded in the winter scheme in all years from 2010. - Species we can analyse are indicated with asterisks - Those excluded from the main season analyses due to the flight season extending beyond the main scheme are indicated with a double asterisk (**).

Table 2: Species with >2000 moths recorded and in 2010 list

Code	Scientific.Name	Common.Name	TotalMoths.WinterPlus	TotalMoths.WinterOnly	Included
66.001	Poecilocampa populi	December Moth	7,404	6,948	*
70.106	Operophtera brumata	Winter Moth	5,359	5,082	*
70.256	Erannis defoliaria	Mottled Umber	3,200	2,994	*
73.194	Conistra vaccinii	Chestnut	7,599	2,893	**
70.247	Phigalia pilosaria	Pale Brindled Beauty	2,475	2,343	*
49.039	Epiphyas postvittana	Light Brown Apple Moth	35,357	2,214	
70.244	Colotois pennaria	Feathered Thorn	4,009	1,815	**
73.244	Orthosia cerasi	Common Quaker	37,949	1,589	
70.109x	Epirrita dilutata agg.	November Moth agg.	7,602	1,107	**
70.095	Chloroclysta siterata	Red-Green Carpet	5,500	1,105	**
70.255	Agriopis marginaria	Dotted Border	2,286	1,055	**
73.190	Leptologia macilenta	Yellow-line Quaker	5,574	978	**
73.249	Orthosia gothica	Hebrew Character	44,692	913	
63.031	Udea ferrugalis	Rusty-dot Pearl	3,709	609	
70.245	Alsophila aescularia	March Moth	2,555	513	**
70.079	Thera britannica	Spruce Carpet	5,187	497	**
73.015	Autographa gamma	Silver Y	12,702	366	
73.113	Phlogophora meticulosa	Angle Shades	4,907	346	
73.242	Orthosia incerta	Clouded Drab	15,944	260	
73.245	Orthosia cruda	Small Quaker	15,161	229	
70.251	Biston strataria	Oak Beauty	2,191	227	
73.189	Leptologia lota	Red-line Quaker	2,902	223	
73.342	Noctua pronuba	Large Yellow Underwing	193,416	186	
70.097	Dysstroma truncata	Common Marbled Carpet	17,481	154	
70.141	Gymnoscelis ruffasciata	Double-striped Pug	7,418	142	
73.206	Lithophane leautieri	Blair's Shoulder-knot	2,745	118	
28.024	Tachystola acroxantha	Ruddy Streak	3,377	116	
73.319	Agrotis segetum	Turnip Moth	5,985	108	
73.069	Xylocampa areola	Early Grey	8,059	104	
70.237	Selenia dentaria	Early Thorn	5,617	87	
73.233	Aporophyla nigra	Black Rustic	6,017	81	
63.052	Nomophila noctuella	Rush Veneer	2,068	37	
73.193	Anchoscelis lunosa	Lunar Underwing	18,951	6	

- Note the most common moths here are really main season species which can occasionally occur in winter. This leaves 12 species that we can potentially analyse for trends using the (augmented) winter data.
- Rusty-dot Pearl was excluded due to data quality issues.

The following moths ([Table 3](#)) were excluded from the main season analyses as the flight period extended beyond the main season but do not have sufficient winter records to enable analysis using the winter data:

Table 3: Species excluded from main season report with <2000 moths recorded

Code	Scientific.Name	Common.Name	TotalMoths.WinterPlus	TotalMoths.WinterOnly
73.195	Conistra ligula	Dark Chestnut	1,253	639
73.210	Eupsilia transversa	Satellite	1,341	458