

GMS REPORT 2010



D. Grundy – March 2011

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GMS INTRODUCTION

GMS has now been running for eight complete years of recording since 2003. This far into our exciting project we can begin to look at trends in common moth species populations. A summary of interesting findings from GMS 2010 and previous years is given below.

WE ARE A NATIONAL GMS

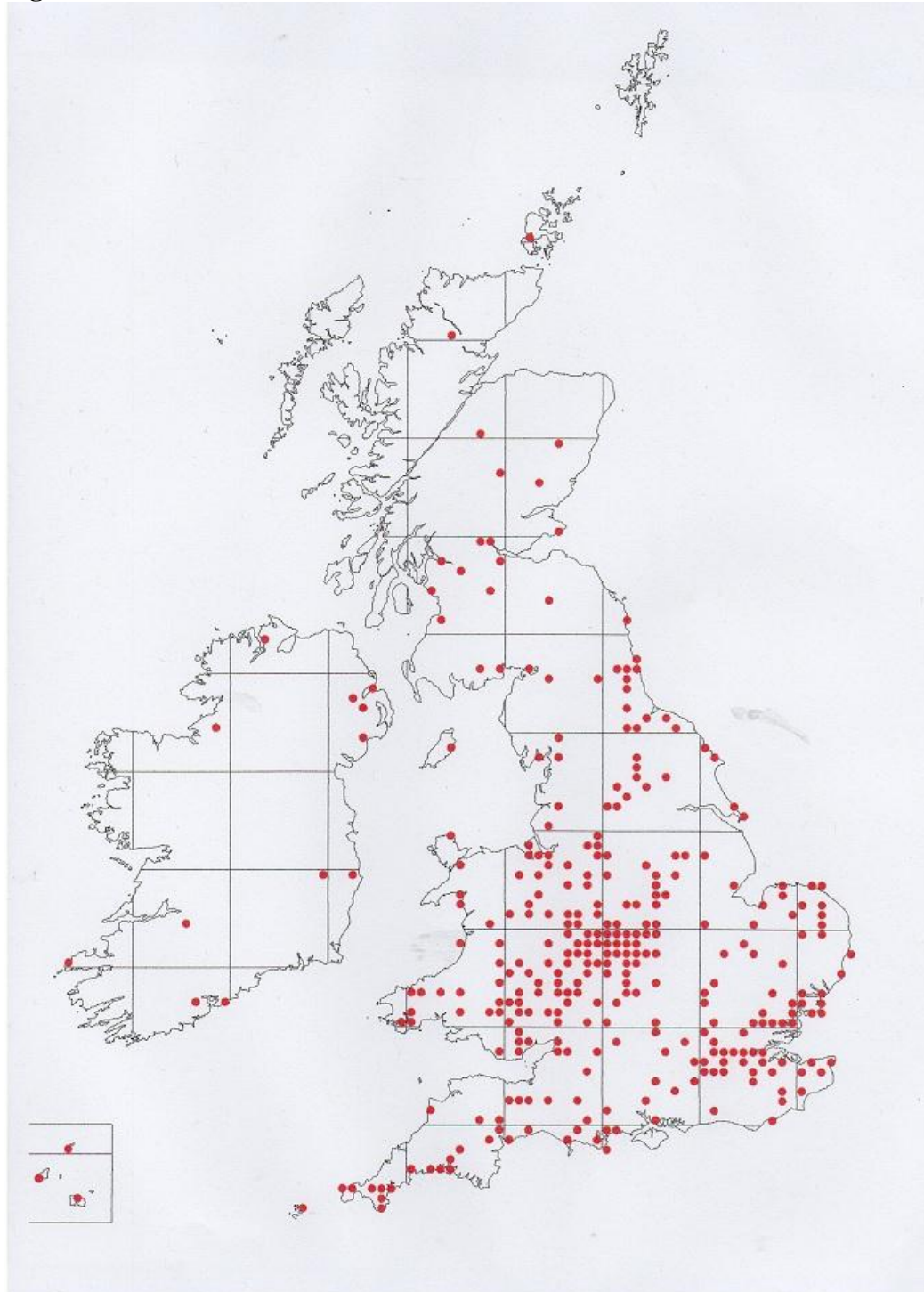
In previous Annual Reports we have wondered whether we could claim that GMS is a national scheme and now we can safely say that it is. We now have an excellent distribution of GMS gardens across Britain and Ireland, for both countries.

The first year of GMS in 2003 started with just 29 recorders and all of them were in the West Midlands. 2007 was the first year that the GMS attempted to become a national recording scheme and achieved a very credible 107 gardens recording across Britain. But distribution of these recorders was rather patchy with over 50% of recorders still coming from the West Midlands of England and none from Ireland.

By 2010 the map of GMS recorder distribution had changed considerably. Concentrations of recorders in the West Midlands, Wales, East and South East England have still increased, but there are many additions elsewhere in Britain and Ireland with nearly 300% increase in the numbers of gardens taking part to 315!

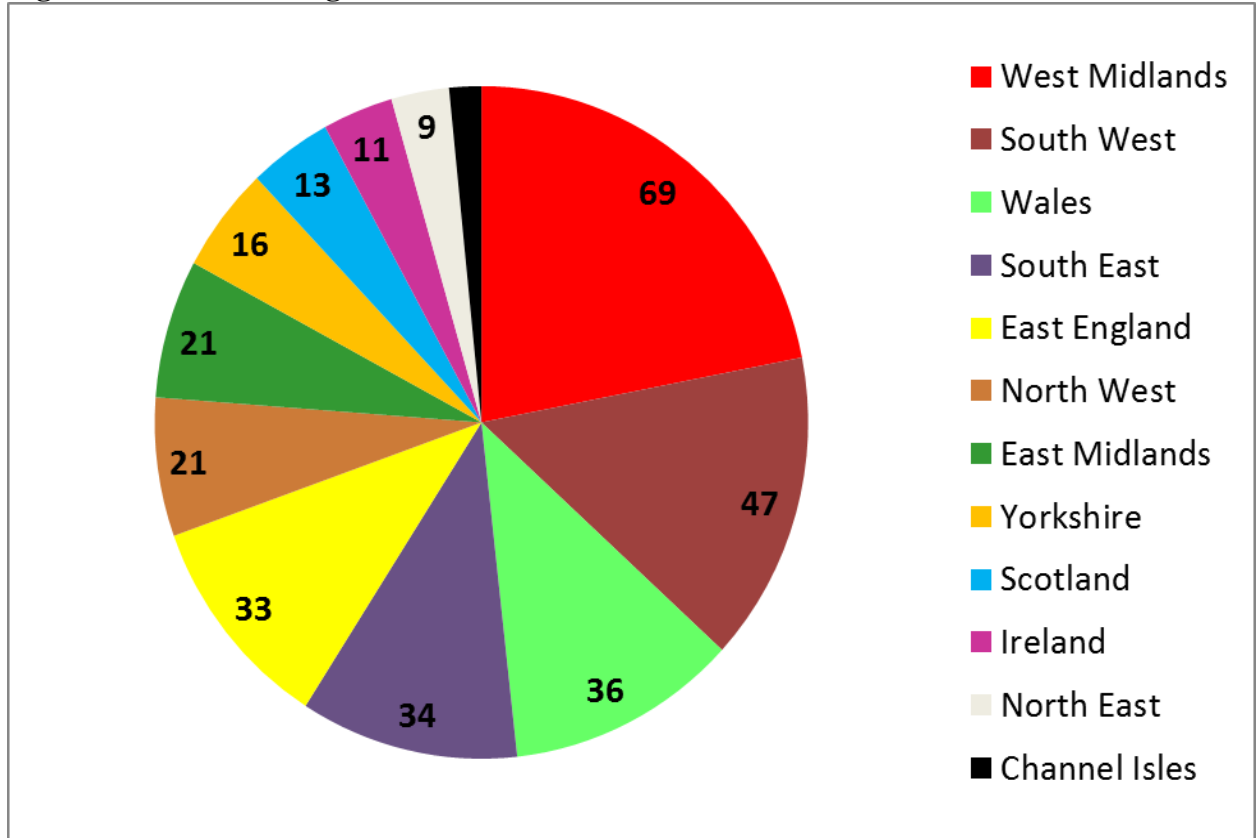
The dot map of GMS garden distribution, shown below, now mirrors where the major population centres are of people across Britain and Ireland. Wherever there are lots of people then you will also find a GMS garden. Also, even in remote areas of Ireland and Scotland there are still GMS gardens dotted across the map. And in 2011 we will have more dots in the gaps on the map!

Figure 1 - Distribution of GMS moth recorders in 2010.



I'm a big fan of dot maps and have particularly enjoyed reading the Provisional Atlas of the UK's Larger Moths (available from Butterfly Conservation). On the GMS map I especially like to see dots arriving from new gardens where there were none last year. Particularly exciting to see in 2010 were our first recorders for the Isle of Man and for Counties Donegal and Leitrim in Ireland. Also good to see were new recorders in Lanarkshire, South Cumbria and on the East Yorkshire coast.

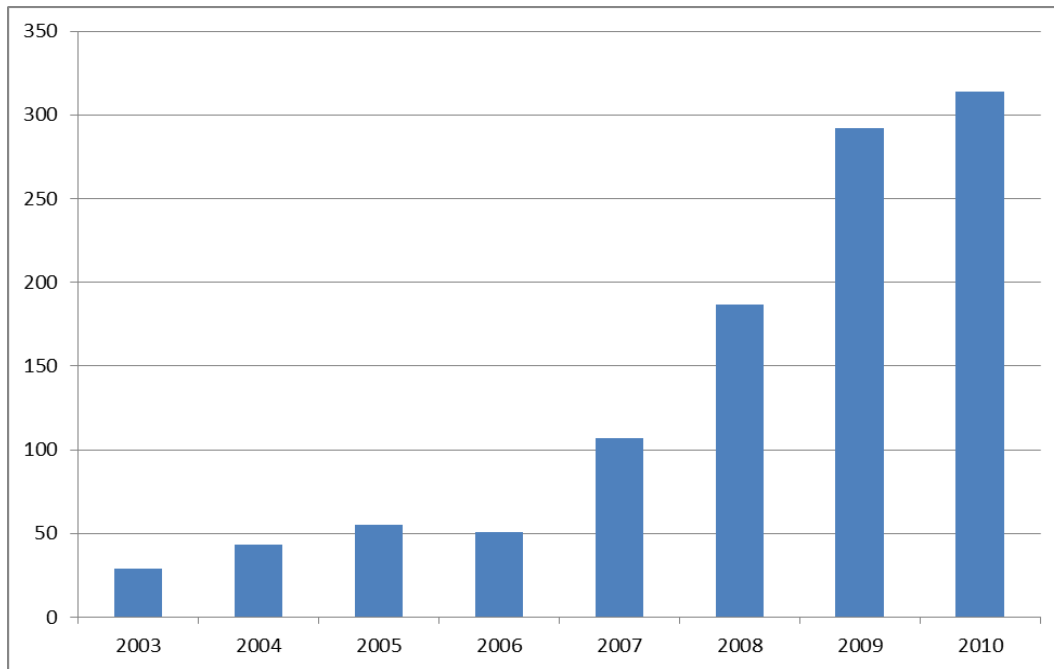
Figure 2 - Pie-chart diagram of distribution of GMS recorders in 2010.



The chart above shows the comparative numbers of GMS gardens from different areas of England, plus Wales, Scotland, Ireland and the Channel Isles (5 gardens). For the sake of this chart Isle of Man gardens are combined with North West England. It can be seen that the West Midlands still has the most gardens contributing records to the scheme, but even though the number of West Midland gardens has increased every year, their contribution is down to 22% compared with over 50% in 2007. To achieve a more valuable GMS recording scheme to assess population changes of common moths for the whole of Britain and Ireland we were aware that a more equal distribution of recorders across all areas was needed and the pie-chart above shows the progress we are making towards this. All the areas of Britain and Ireland now show good numbers of GMS recorders allowing useful comparisons of results from different areas.

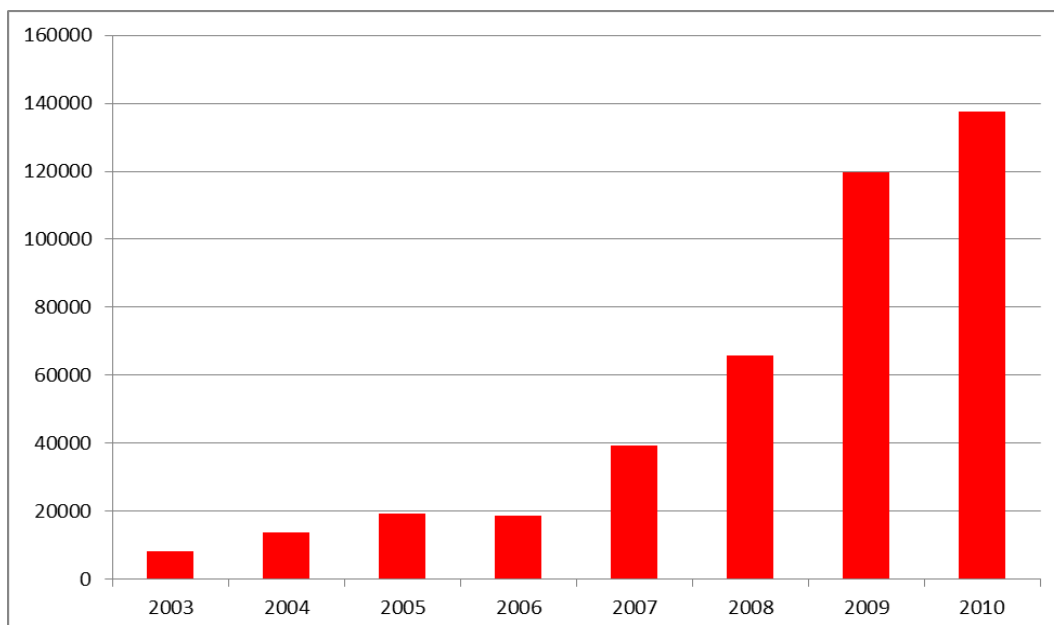
The increase in total numbers of GMS gardens across all areas has been dramatic since the start in 2003:
 2003 = 29, 2004 = 43, 2005 = 55, 2006 = 51, 2007 = 107, 2008 = 187, 2009 = 292, 2010 = 315. This is illustrated in the graph below:

Figure 3 - Increase in numbers of GMS gardens 2003 – 2010



The table below shows the total number of moth records that were input into the GMS moth database in each year from 2003 to 2010. As would be expected this increase closely mirrors the increase in numbers of gardens. The actual figures for numbers of records that have been input are;
2003 = 8,357, 2004 = 13,874, 2005 = 19,341, 2006 = 18,670, 2007 = 39,230, 2008 = 65,943, 2009 = 119,567, 2010 = 137,626. This gives a total number of records in the database as 422,608, which is fantastic, thanks to everyone who contributed for one or more years.

Figure 4 - Increase in numbers of GMS records entering the database 2003 – 2010



Note - these figures are for 314 gardens in 2010, but since these calculations additional late records have come in from an additional garden. All the above figures exclude all winter GMS records. Winter GMS records for the last three years are being input to the database as I write this!

THE ‘GUINNESS BOOK OF GMS MOTH RECORDS’?

Some interesting findings from our records;

- Most traps run by one recorder in GMS; 5 traps run by Roy Cripps in the Isle of Man, 4 traps run by Danny Arnold in Worcestershire.
- Oldest recorder? = I’m too polite to ask!
- Youngest recorder = Liam Connor, Alderney in the Channel Isles aged 7 (he does get help from a more experienced recorder who lives nearby for difficult identifications, but already he has found his own Clifden Nonpareil – a moth that I’m still waiting to see and I’m 50 years older!)
- Furthest West = Jill Crosher from Tralee, County Kerry
- Furthest East = John Everson from Southwold, Suffolk

(Now we need volunteers from the Blasket Isles in Ireland and from an oil rig in the North Sea to extend further!!)

- Most GMS species recorded = David Wedd, Alderney (240)
Dave Dutton & Moira Jackson, Wivenhoe, Essex (225)
Ian & Laurence Machin, Bewdley, Worcestershire (224)
- Number of different trap types used = 44
- Number of different recorders since 2003 = 417

TOP 30 GMS SPECIES IN 2010

		2010	2009	
Position	Name	313 gardens	292 gardens	Up/Down
1 (1)	Large Yellow Underwing	210.81	189.50	UP
2 (3)	Heart & Dart	88.67	66.18	UP
3 (2)	Setaceous Hebrew Character	86.65	69.75	UP
4 (4)	Dark Arches	65.21	45.29	UP
5 (8)	Hebrew Character	59.11	35.55	UP
6 (59*)	Common Rustic agg.	44.77	5.18	UP
7 (16)	Garden Grass Veneer	44.23	21.34	UP
8 (9)	Common Quaker	43.49	31.65	UP
9 (7)	Lesser Broad-bordered Yellow Underwing	31.86	36.13	DOWN
10 (5)	Flame Shoulder	31.50	40.56	DOWN
11 (10)	Riband Wave	28.38	28.38	
12 (21)	Shuttle-shaped Dart	27.65	15.92	UP
13 (15)	Common Footman	26.18	21.49	UP
14 (11)	Square-spot Rustic	24.45	27.84	DOWN
15 (35)	Vine’s Rustic	24.32	8.75	UP
16 (23)	Small Quaker	23.42	15.40	UP

17 (6)	Light Brown Apple Moth	22.29	36.50	DOWN
18 (12)	Lesser Yellow Underwing	22.23	24.62	DOWN
19 (14)	Brimstone Moth	18.91	22.27	DOWN
20 (31)	Clouded Drab	18.82	10.13	UP
21 (25)	Flame	18.81	14.20	UP
22 (28)	Buff Ermine	18.10	12.40	UP
23 (54)	<i>Agriphila tristella</i>	17.04	5.69	UP
24 (106*)	Marbled Minor agg.	16.71	2.49	UP
25 (19)	Willow Beauty	16.34	17.83	DOWN
26 (26)	Mother of Pearl	16.05	13.50	UP
27 (40)	<i>Agriphila straminella</i>	15.14	7.52	UP
28 (18)	Silver Y	14.66	18.58	DOWN
29 (20)	Small Square-spot	14.64	16.29	DOWN
30 (37)	<i>Crambus pascuella</i>	13.91	8.10	UP

The table above lists the 30 commonest moths in GMS recording for 2010, in order of the number of moths recorded in the year from the 313 gardens from which records had been received when I collated these figures (two more have come in since). The position shows the place of the moth in the top 30 species for 2010 with the 2009 position shown in brackets. The figures for 2010 and 2009 are the average numbers of moths of each species recorded per garden. So, for instance in 2010 a total of 65,985 Large Yellow Underwings were recorded by all recorders. This figure is then divided by the number of gardens in the scheme, to give the average numbers recorded per garden as shown. This figure can then more easily be compared from year to year. The final column shows whether the species increased on average per garden or decreased (Riband Wave stayed at the same figure).

The most noticeable climbers in the charts were Common Rustic agg. and Marbled Minor agg., but these increases are artificial because these species aggregates were added to recording forms for all areas in 2010. Vine's Rustic was also added to the form for 2010 for some areas where it wasn't previously counted.



Shuttle-shaped Dart increased in 2010



Silver Y decreased in 2010

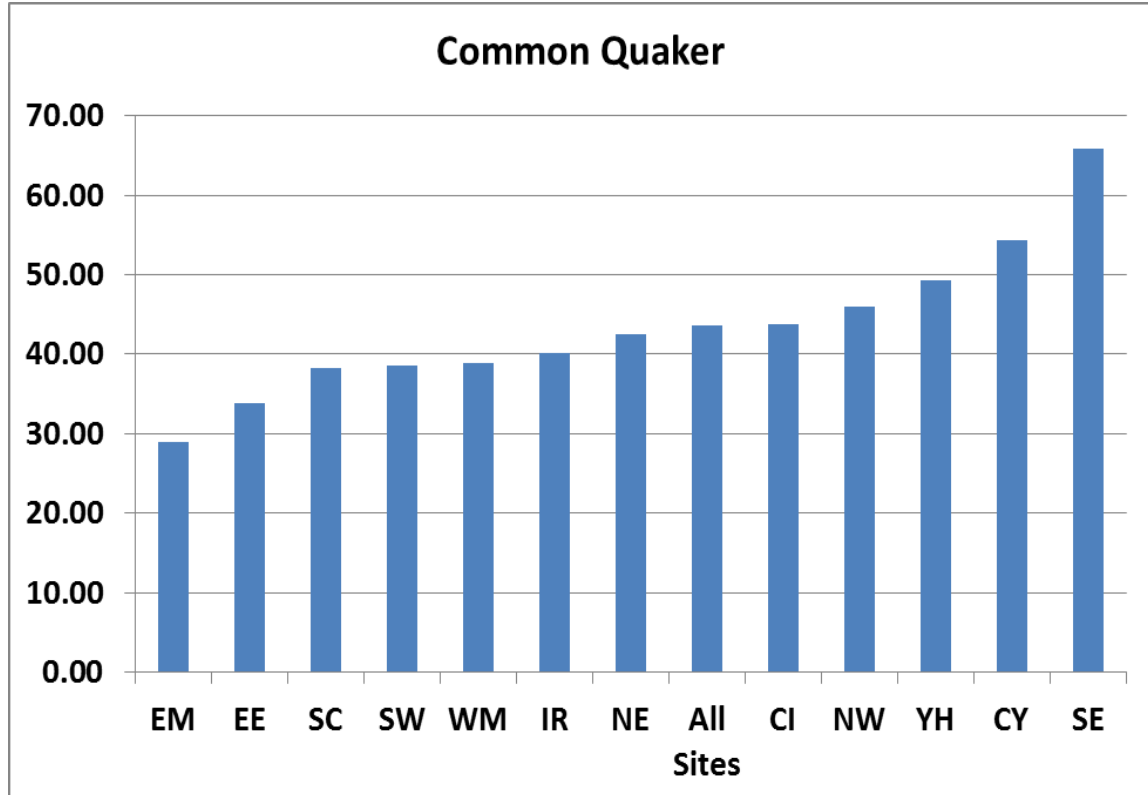
Species that really did increase by around 50% were four of the grass pyralid moths; Garden Grass Veneer *Chrysoteuchia culmella*, *Agriphila tristella*, *Agriphila straminella* and *Crambus pascuella*. Also with large increases were the spring fliers Small Quaker and Clouded Drab with the slightly later spring flier Shuttle-shaped Dart. A large fall was recorded for Light Brown Apple Moth and some recorders have speculated that this could have been due to a very cold start to 2010 in winter. Also falling in numbers was the common migrant Silver Y as 2010 definitely wasn't a notable migrant year.

GMS MOTH RECORDS; A COMPARISON BETWEEN AREAS

Now that good numbers of gardens take part in GMS for all 12 major areas of the GMS, comparisons can be made for species for all of these areas. If a species is referred to as common or very common across all of Britain and Ireland, is it equally common in all areas, or is it commoner in some areas than others. The charts below show how common each species was for each area as an average number of moths recorded for that species per garden in 2010.

a. Common Everywhere?

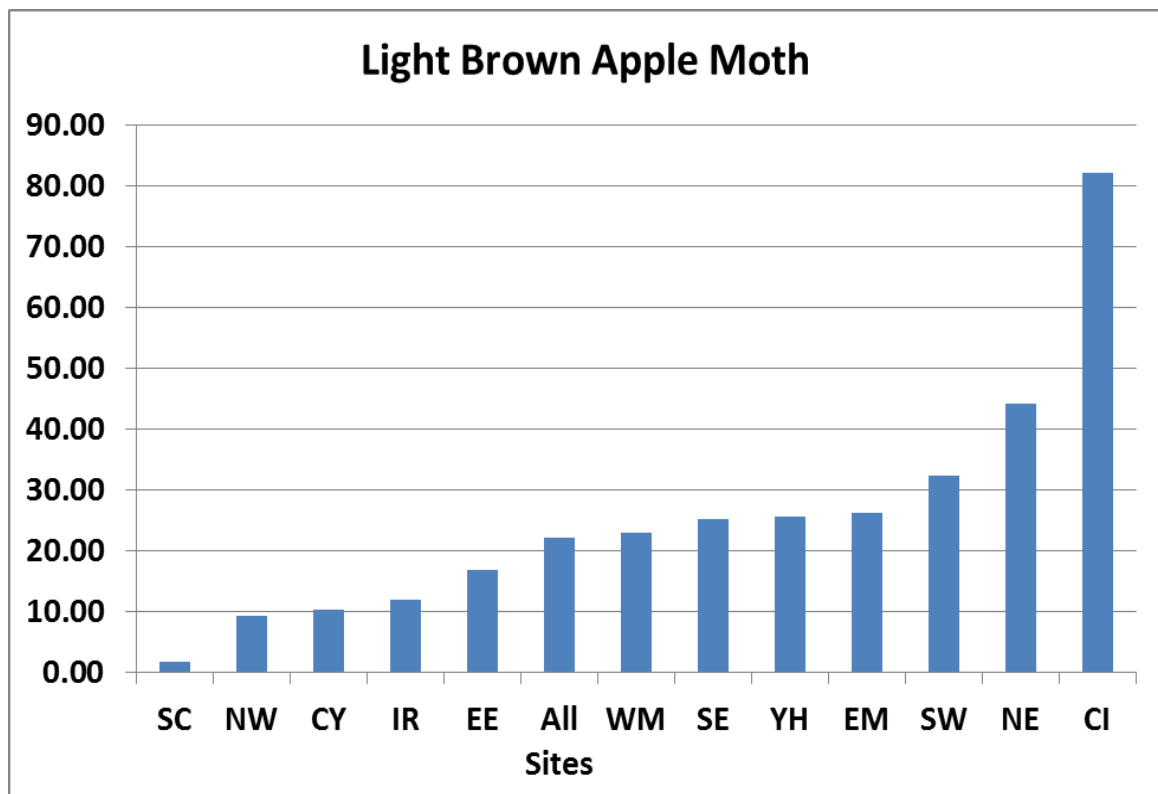
Figure 5 - Common Quaker across all areas



The graphs use abbreviations for all areas as follows; CI = Channel Isles, SW = South West England, SE = South East England, IR = Ireland, CY = Cymru or Wales, WM = West Midlands, EM = East Midlands, EE = East of England, NW = North West England and the Isle of Man, YH = Yorkshire and Humberside, NE = North East England, SC = Scotland. The geographical areas of England are as used by Natural England and other Government offices. The All Sites figure is the average for all 313 gardens measured in this comparison. The graph above of Common Quaker shows a very similar figure for most areas, showing that it is common everywhere, but maybe slightly scarcer in East Midlands and slightly commoner in the South East and Wales.

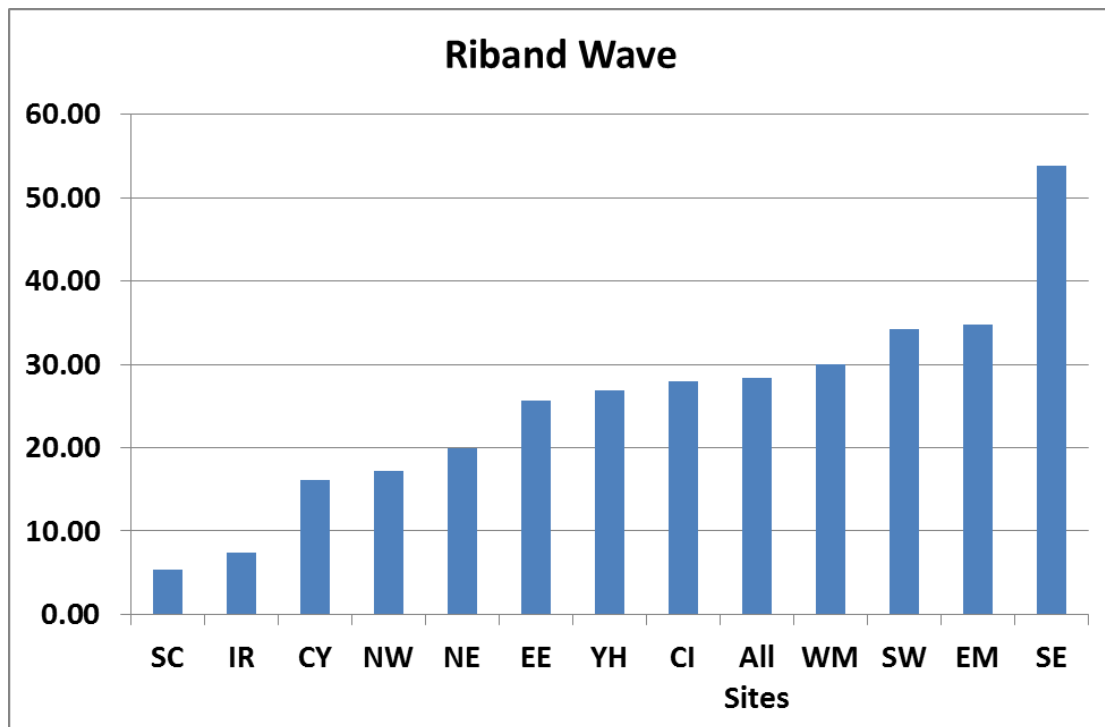
b. Scarce in North and West?

Figure 6 - Light Brown Apple Moth across all areas



Light Brown Apple Moth shows a pattern of being much commoner in the South, where it expanded from; South West and particularly the Channel Isles, but much scarcer in the north and west; Scotland, Wales, Ireland and North West. This is understandable as the species has only recently colonised these areas. However, it is less certain what causes the high figure in the North East?

Figure 7 - Riband Wave across all areas



Riband Wave shows a distinct trend of being scarcer in the North and West (SC, IR, CY, NW) and commoner in the South East.



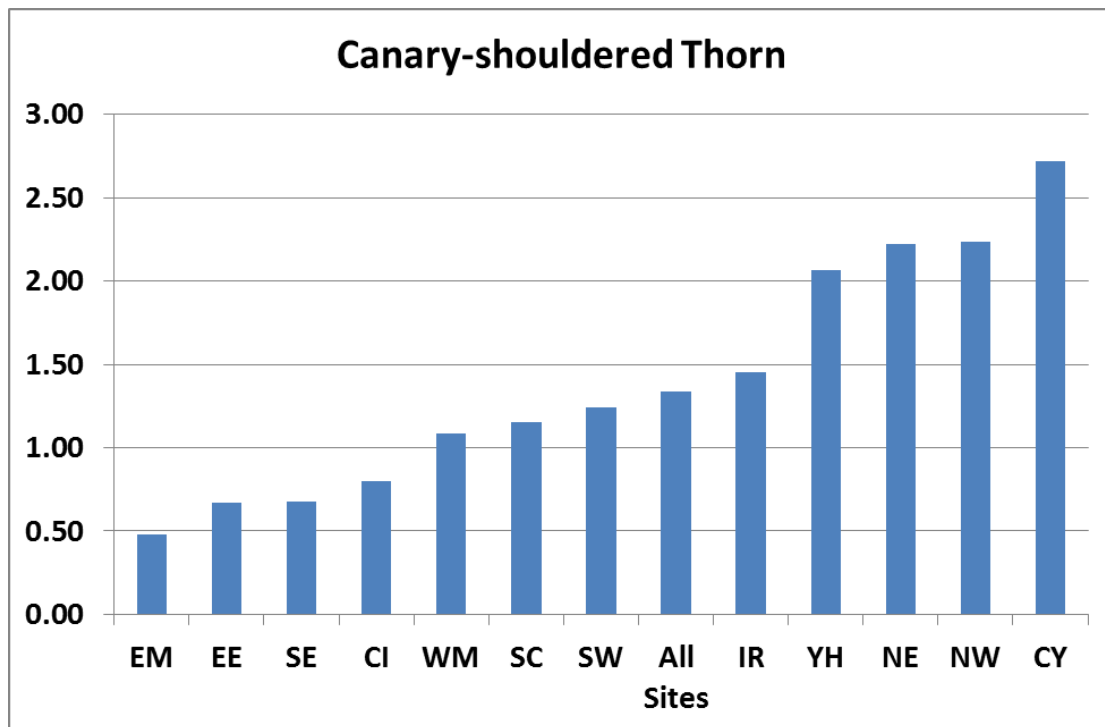
Light Brown Apple Moth

Riband Wave

c. Scarce in South and East?

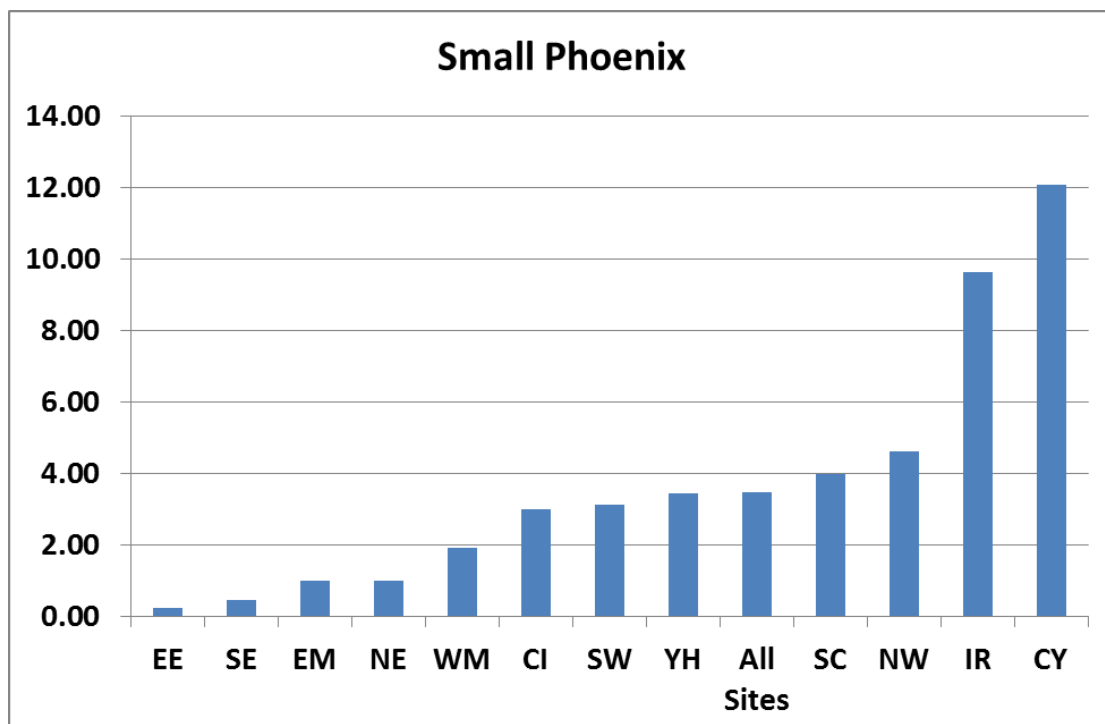
Canary-shouldered Thorn (below) shows the opposite trend to the previous two species, being scarcer in the South and East (EM, EE, SE and CI) and commoner in the North and West (NE, NW and CY). However, interestingly there was only an average figure for Scotland.

Figure 8 - Canary-shouldered Thorn across all areas



Small Phoenix showed a similar trend, although maybe being scarcer in the East (EE, SE, EM, NE) and commoner in the West (CY, IR, NW).

Figure 9 - Small Phoenix across all areas



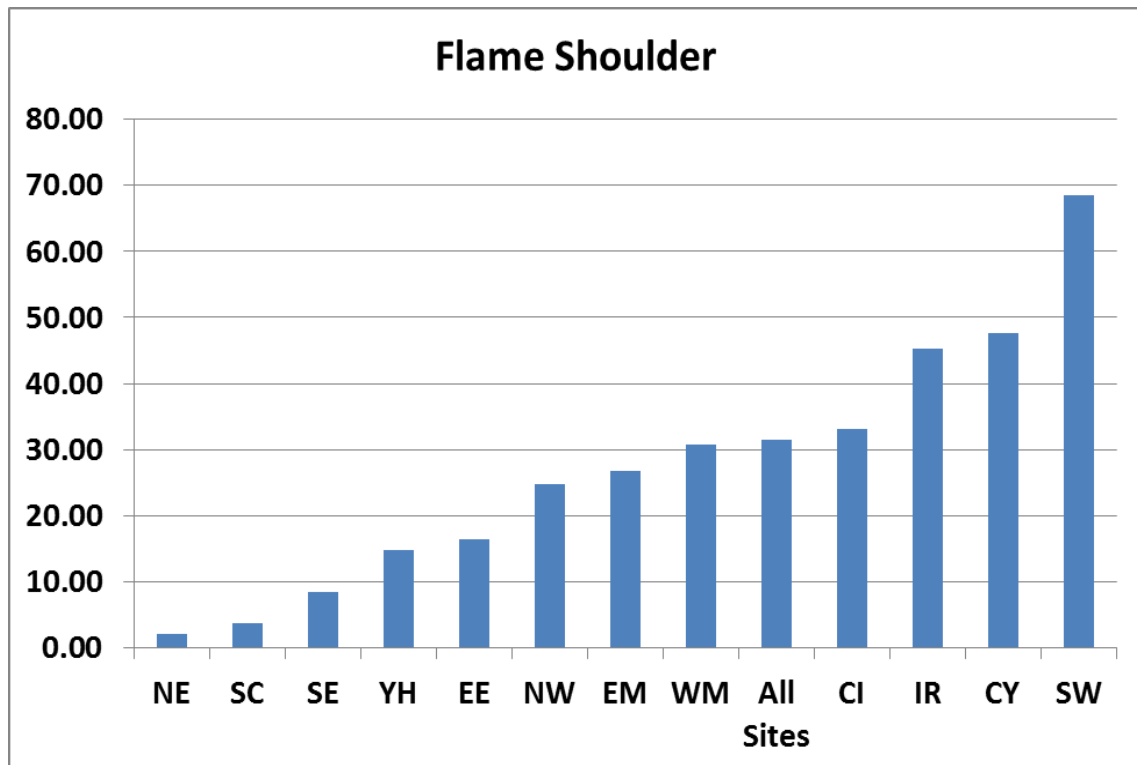


Canary-shouldered Thorn

Small Phoenix

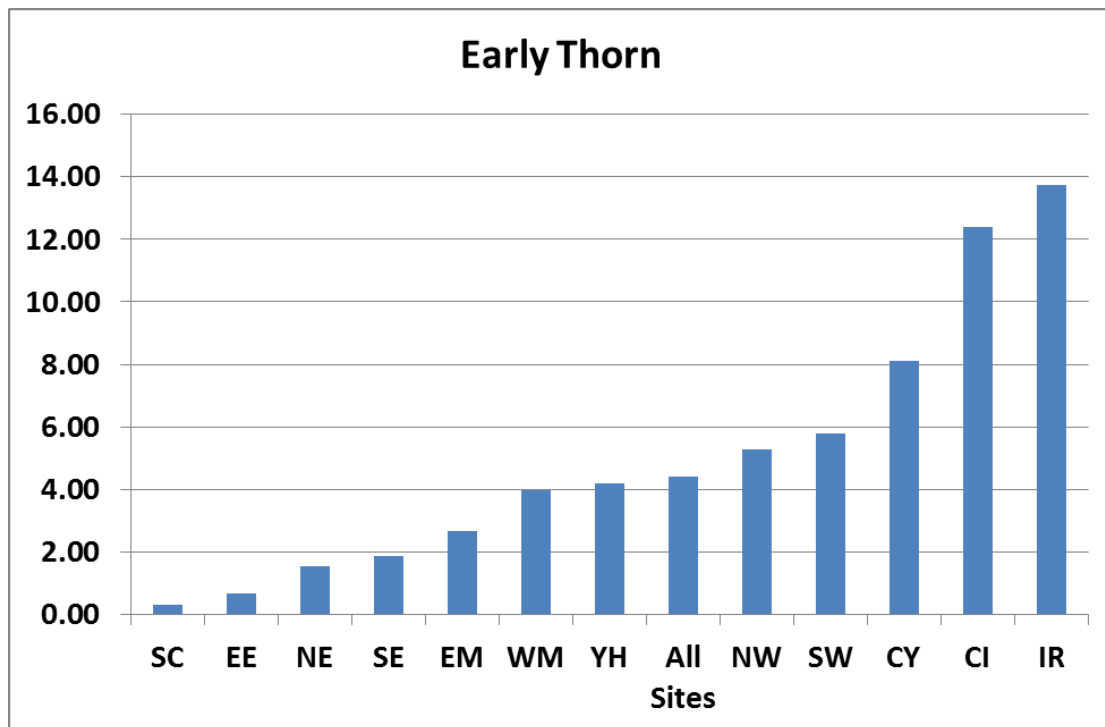
d. Scarce in Scotland and the East?

Figure 10 - Flame Shoulder across all areas



Most Scottish GMS recorders would let you know that Flame Shoulder is a scarcer species in their area, but it is interesting that it is also scarce in the East (NE, SE, YH, EE). The species is noticeably commoner in the South West (SW, CY, IR).

Figure 11 - Early Thorn across all areas



Early Thorn has a similar pattern to Flame Shoulder, being scarcer in the North and East (SC, EE, NE, SE, EM), whilst being commoner in the South and West (IR, CI, CY, SW).



Flame Shoulder

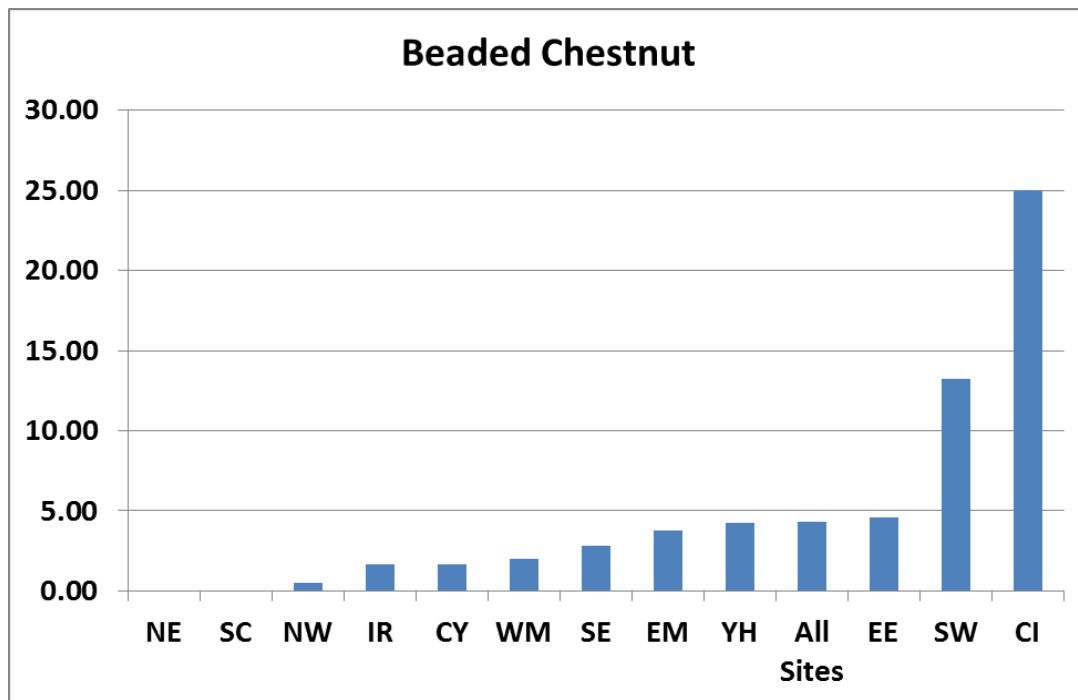


Early Thorn

e. Scarce in Scotland and the North?

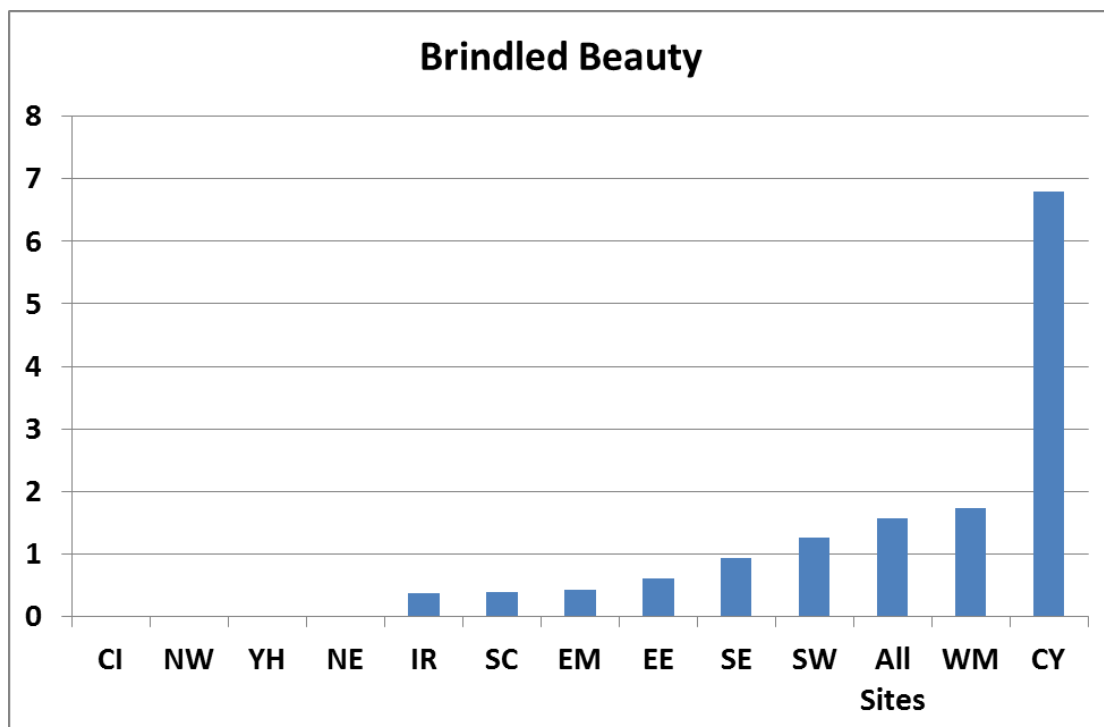
Beaded Chestnut (below) shows a pattern of being scarce in the North (NE, SC, NW), whilst at the same time common in the South (CI, SW).

Figure 12 - Beaded Chestnut across all areas



f. Commoner in the West?

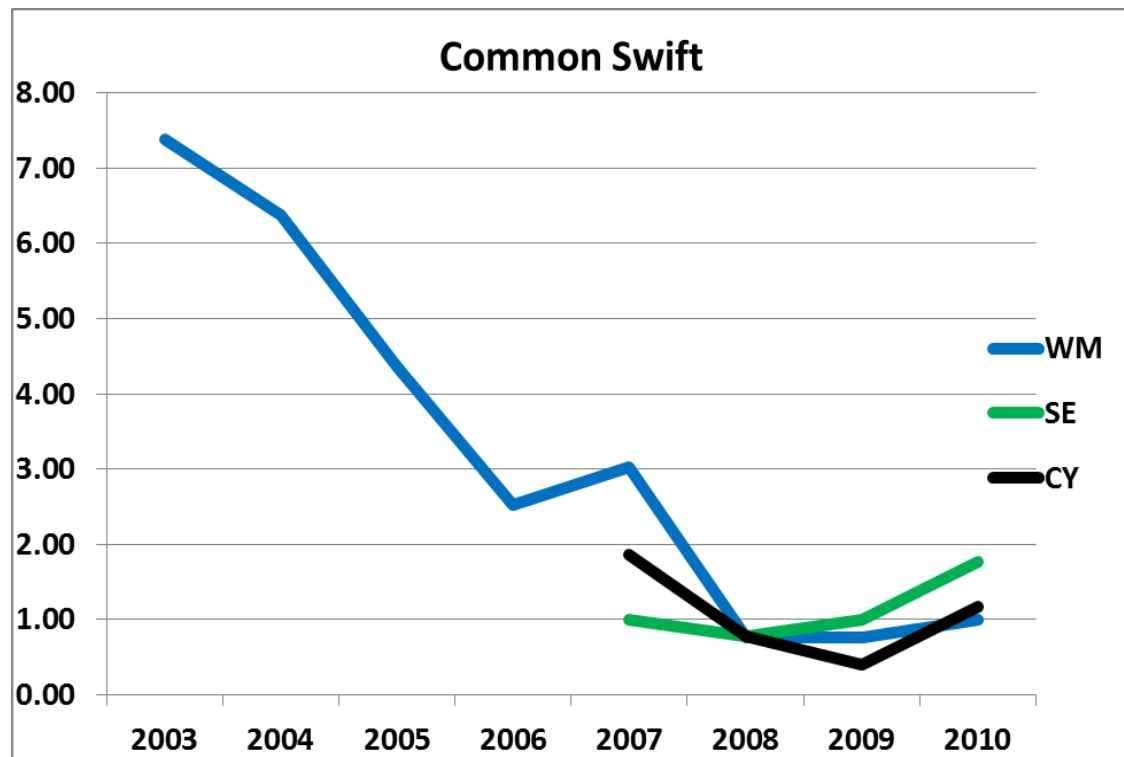
Figure 13 - Brindled Beauty across all areas



Brindled Beauty shows an even more extreme trend, not being recorded from CI, NW, NE, YH, whilst being very common in Wales.

MOTH POPULATION TRENDS IN THE WEST MIDLANDS, WALES, EAST AND SOUTH EAST OF ENGLAND 2003 – 2010

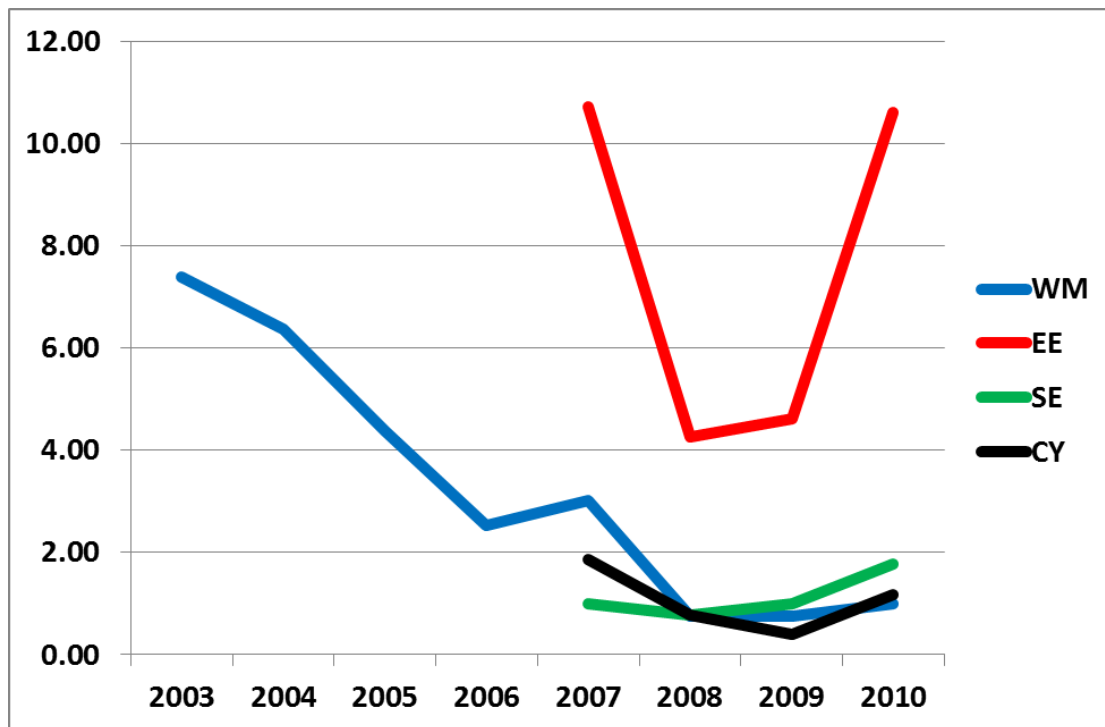
Figure 14 - Common Swift in three areas



Common Swift has been reported in previous GMS Annual Reports for its distinct decline over the period of GMS since 2003 and this is shown clearly in the eight years of data as shown in the graph above for the West Midlands, with a levelling out over the last two years. Added to the graph are the figures for SE and Wales in green and black on the graph for the last four years of recording. It can be seen that all three areas are showing roughly parallel figures, although a longer period of records is needed to assess this more fully.

However if the East of England figures for the last four years are added to the graph then the picture changes significantly, as in the graph below (in red). It will be interesting to try and assess why the East of England garden figures are much higher and why they appear to be showing a different trend of steep decline followed by steep increase.

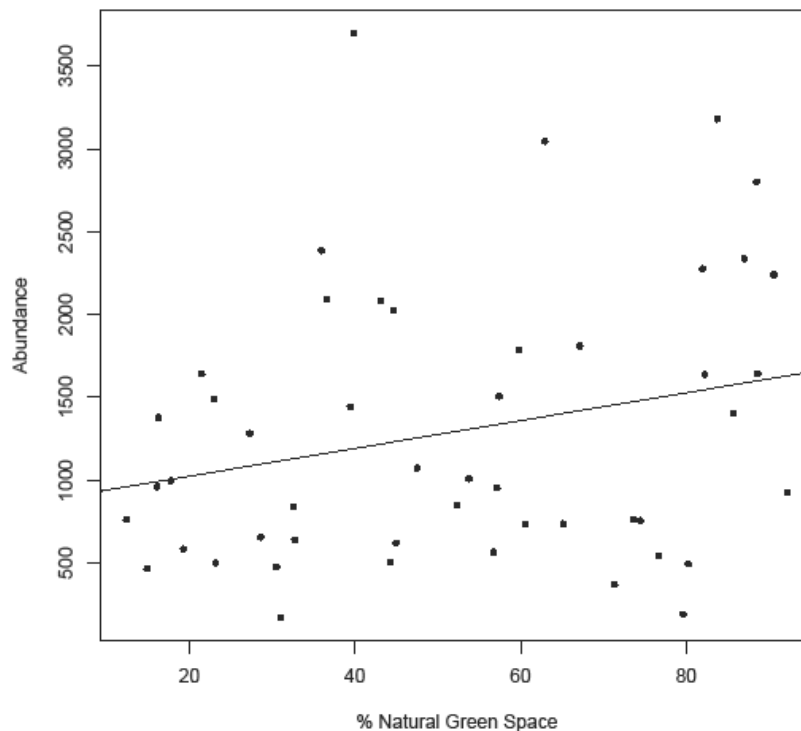
Figure 15 - Common Swift in four areas



FURTHER FINDINGS FROM THE BIRMINGHAM UNIVERSITY RESEARCH INTO THE GMS DATABASE

Jon Sadler of Birmingham University has carried out further research into the GMS database using data from 2010 and previous years. In the figures below are some of his findings as a taster of work to come. This research has looked into 2009 moth catches for a series of 49 West Midland gardens and compared with Geographic Information System (GIS) data. GIS is a technique for storing and analysing spatial data for an area and the system used by the University uses local Ordnance Survey data and the university's own Near Infrared data to analyse features within one kilometre of each GMS garden. Moth catches have then been analysed in comparison with features such as tree cover and green space. The graphs below show GMS data plotted against the percentage cover of natural green space within one kilometre.

Figure 15 - Moth trap abundance compared with proportion of nearby green space.

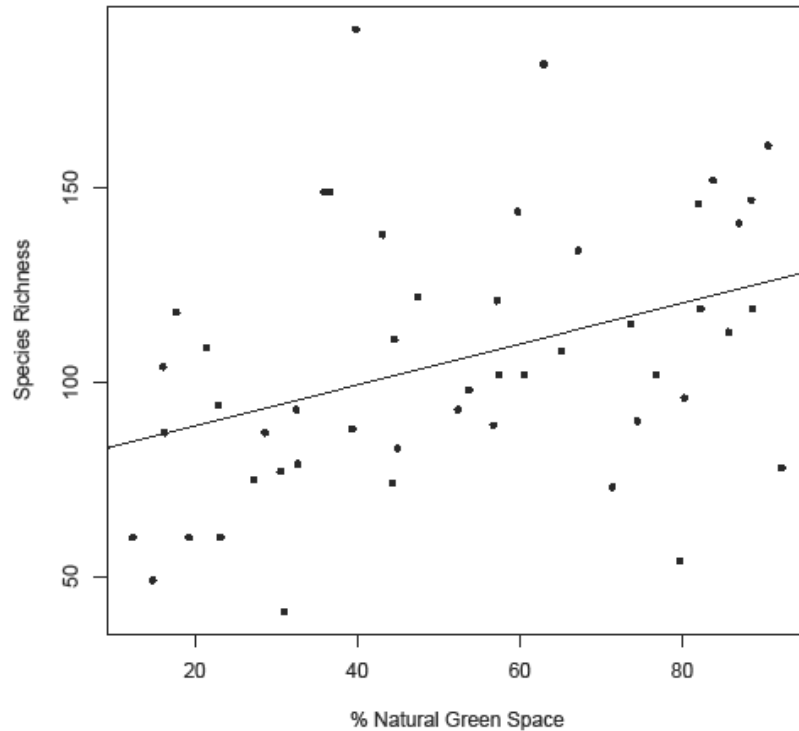


The graph above shows the total number of moths caught in each garden in 2009, with the best garden recording over 3500 moths over the 36 nights of summer GMS and the poorest garden under 500. This is then plotted against the percentage of natural green space within one kilometre of the garden. The line above shows a correlation between natural green space and numbers of moths caught in a moth trap, with the most rural gardens shown on the right of the graph. The line plotted above shows this correlation with a value of $p=0.001$, that means that there is a 1 in 1000 chance of this pattern appearing by chance.

A similar graph was then plotted using data for species richness of around 250 common species

This graph below is calculated in the same way as the previous one, but measuring total number of GMS species recorded in a garden over the 36 weeks of summer GMS. The richest gardens recorded close to 200 species with the poorest gardens recording less than 50 species. The graph shows a correlation between these features with a value of $p=0.0063$, meaning that there is a less than a 7 in 1,000 chance of this correlation occurring by chance. counted in GMS.

Figure 16 - Species richness compared with proportion of nearby green space.



The same features have been plotted against percentage tree cover in the next two graphs. Percentage tree cover is the percentage of the area within one kilometre that is covered by tree canopy. There is an interesting spread of gardens on these graphs, with one garden at around 40% tree cover, a cluster of gardens at around 20% cover and a larger group with less than 10% tree cover.

The graph below, again shows the total number of moths caught in each garden in 2009. This is then plotted against the percentage of tree cover within one kilometre of the garden. The line above shows the correlation between tree cover and numbers of moths caught in a moth trap. The line plotted above shows this correlation with a value of $p=0.01$, that means that there is a 1 in 100 chance of this pattern appearing by chance.

Figure 17 - Moth trap abundance compared with proportion of tree cover.

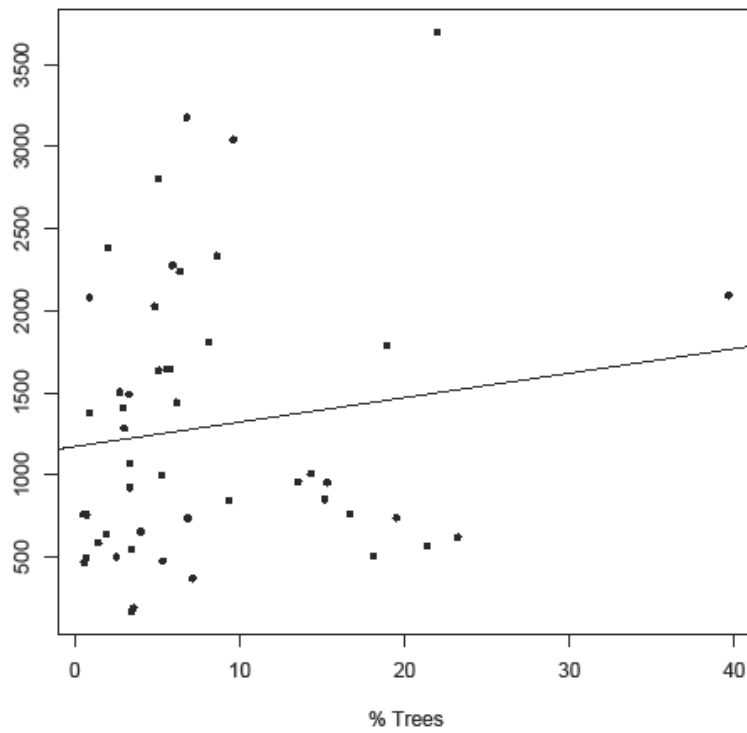
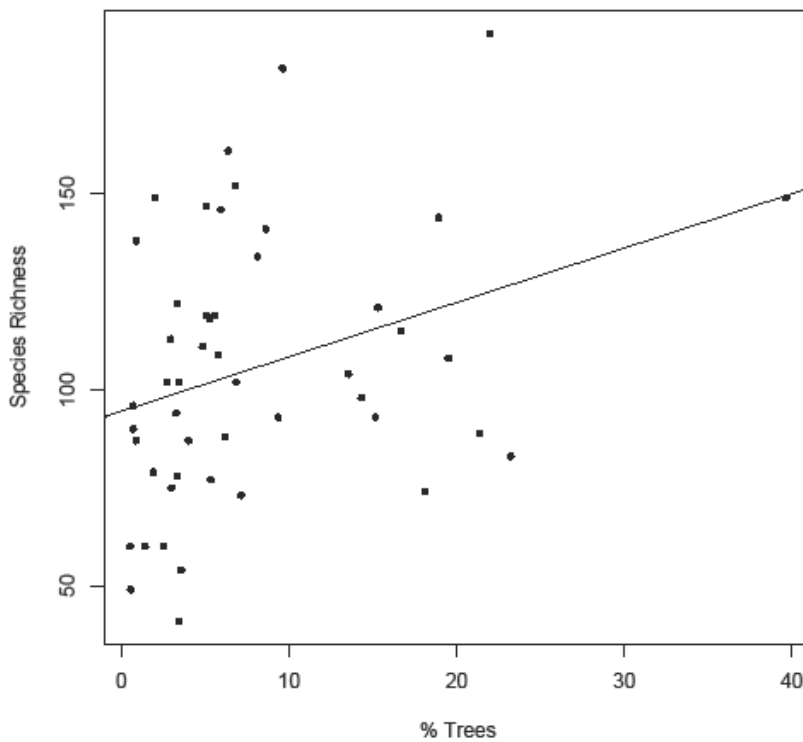


Figure 18 - Species richness compared with proportion of tree cover.



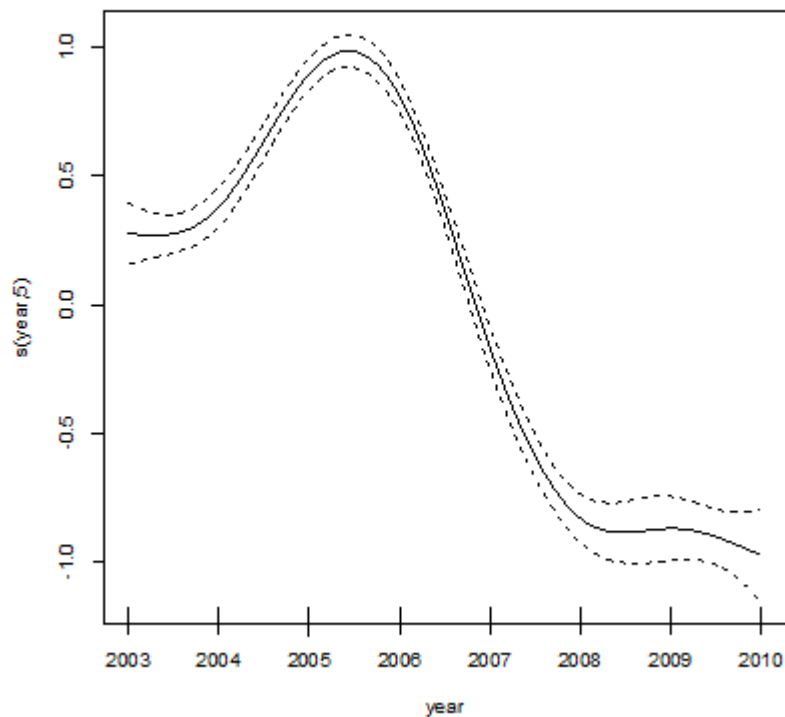
This graph is calculated in the same way as the previous one, but measuring total number of GMS species recorded in a garden. The graph shows a line of correlation

between these features with a value of $p=0.02452$, meaning that there is a less than a 3 in 100 chance of this correlation occurring by chance.

TRENDS FOR TWO SPECIES OVER THE LAST EIGHT YEARS

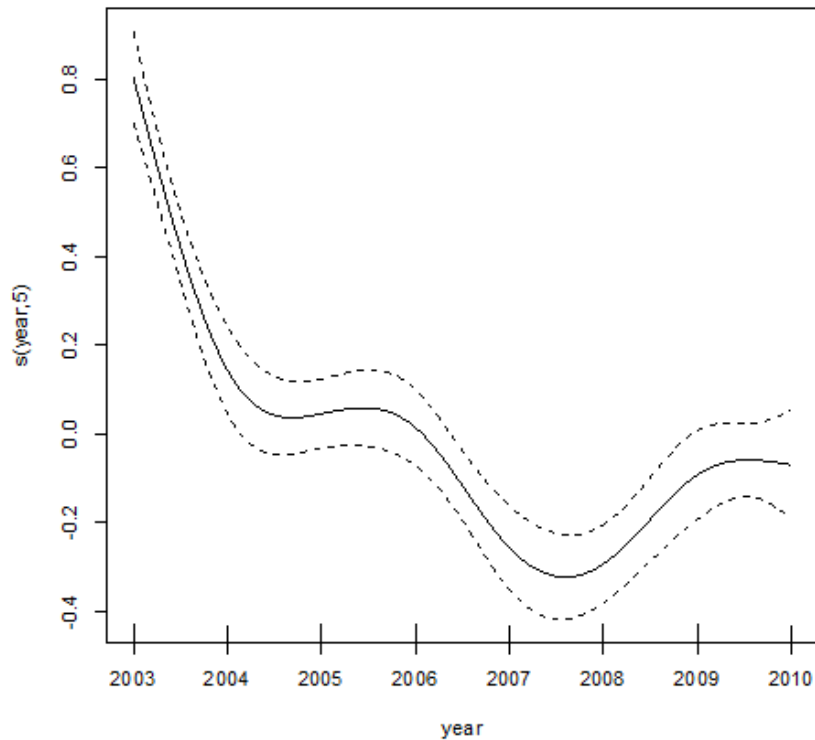
Longer term trends in abundance for species over the eight years of GMS have been plotted by Jon Sadler. The graphs below use time series analysis for all GMS gardens from all areas with four or more years of data.

Figure 19 - Trends in abundance of Lunar Underwing *Omphaloscelis lunosa* in GMS gardens from 2003 to 2010.



The graph above shows population trends for Lunar Underwing across GMS gardens from 2003 to 2010 ($p \leq 0.001$). This means that there is a less than one chance in a thousand of this pattern occurring by chance. The figures on the left of the graph show the numbers of moths recorded per garden per year, but this is shown as the 'gam' which stands for general additive model. This is an accepted statistical way to create an index of moth abundance per year. The graph above clearly illustrates a period of slight increase to 2005 followed by a serious decline in population to around 2008 and then a levelling out of numbers. A longer series of GMS data is needed to show whether this pattern continues or whether the population bounces back again over the next few years.

Figure 20 - Trends in abundance of Smoky Wainscot *Mythimna impure* in GMS gardens from 2003 to 2010.



The graph above shows the population trends for Smoky Wainscot in GMS gardens over the same period ($p \leq 0.001$). This means that there is a less than one chance in a thousand of this pattern occurring by chance. This species has again shown a serious decline over the eight years, but with a different pattern. There is a drop from 2003 to 2004 followed by a levelling off to 2006 then another decline to 2007 and 2008. Since then there has been a slight increase. Again a longer series of data is needed to work out exactly what is involved, but the graph might indicate an initial serious decline, followed by a levelling off since 2004.



Lunar Underwing and Smoky Wainscot both declined from 2003 to 2010

As we collect longer series of records for more years for species then these graphs will tell us more about what is happening to our commoner moth species. We will discover which species are increasing, which are declining and which are maybe holding level. Maybe we will start to see patterns where say most autumn species are declining, or most grassland species or most that overwinter as eggs etc.

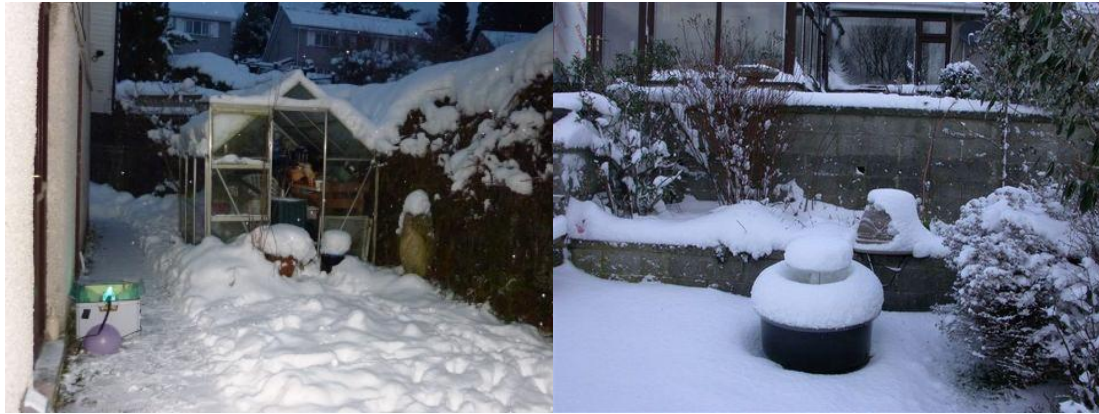
Recorders will see from the statistics above that these trends in species are drawn from gardens that have recorded for four or more successive years. Therefore we can't stress enough how important it is for recorders to try to keep recording for as many years in a row as possible to make the records from their garden even more valuable. So, if you have just recorded for one complete year for GMS then that is fantastic, but please don't think that is enough – please try and record for a second year and so on. And if you have missed recording for one year then please try and record again in the next year if possible.

OTHER 2010 GMS NEWS

- GMS AGM sponsored by MapMate in March 2011 was better than ever! With exceptional speakers, catering, stalls and venue and most importantly over 90 attending GMS-ers.
- A higher public profile to attract more GMS participants through an annual GMS article starting in Atropos magazine.
- Continuing partnership with OPAL and Birmingham University helped GMS advance further, in 2010 this enabled;
 - 10 free Beginner's GMS Moth Kits given out to new GMS starters in time for GMS 2011 – to recorders from Shropshire to Suffolk and Devon to Derbyshire.
 - Help with production of two GMS training moth tips leaflets was completed in 2010.
 - Help with display material to appear at shows; photos, posters and leaflet all produced to attract more recorders.
 - This led to GMS first appearance at a show the BENHS in London in November.
 - Help with GMS data analysis continued successfully in 2010 (see above).

GMS WINTER 2010/11

- We have just completed our third successful year of winter GMS.
- Over 90 gardens completed the winter scheme.
- This was a record count following 69 in year 2 and 44 in year 1.
- Early findings suggest December Moth will probably be the commonest moth again, but with the *Orthosia* moths doing very well thanks to a very warm last week in the winter GMS!
- Record cold winter temperatures and snow occurred before Christmas, but with a much warmer January and February than in the previous winter.
- Further breakdowns of figures will be listed in the Winter GMS News out soon.



The snowiest winter yet? – Heather Young, Stirling and Steve Orridge, Buxton

ACKNOWLEDGEMENTS

Our thanks are due to all the GMS moth-trappers that take part in the GMS and put their moth trap out there whatever the weather and count all the moths – without them, none of this report would be possible. It also needs stressing that the gardens with low numbers of moths are just as valuable to GMS as the very rich gardens. Also thanks to all the Area Coordinators and other volunteer helpers who help the GMS to run smoothly whether moderating the GMS chatsite for us or helping organise the Annual General Meetings or anything else! Also to all the sponsors of GMS, who have helped out with donations since 2003. They have helped oil the wheels of this growing machine. Special thanks among these sponsors goes out to OPAL and especially to Jon Sadler, Adam Bates and colleagues at Birmingham University for their help with donation of GMS Beginner's Moth Kits, publicity material and of course the invaluable research into the GMS database.

REFERENCES

Fox, R., Conrad, K.F., Parsons, M.S., Warren, M.S. & Woiwood, I.P., 2006. *The State of Britain's Larger Moths*. Butterfly Conservation and Rothamsted Research, Wareham, Dorset.

Grundy, D., 2010. *GMS Report 2009*. Unpublished GMS report.

Hill, L., Randle, Z., Fox, R. and Parsons, M., 2010. *Provisional Atlas of the UK's Larger Moths*. Butterfly Conservation, Wareham, Dorset.

Waring, P., Townsend, M., Lewington, R., 2009. *Field Guide to the moths of Great Britain and Ireland*. Second Edition, British Wildlife Publishing, Gillingham, Dorset.

Sponsorship from the following sponsors has helped to make GMS such a success in 2010, we hope they will continue to support us in 2011. Please try and use them when you need support for your moth study as every purchase from these suppliers indirectly helps the GMS.



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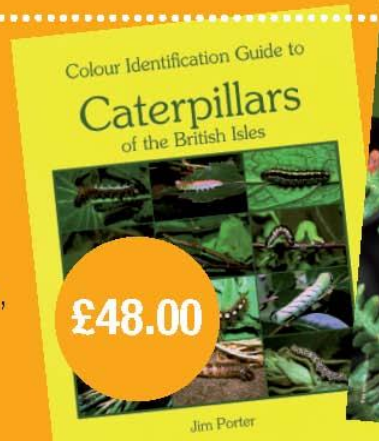
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