

**Butterfly
Conservation**

Saving butterflies, moths and our environment



E-moth

Moths Count update April 2016

Spring has apparently arrived, although here in Dorset the nights are cooler now than they were during December last year. The moth trap has only been out a few times at Butterfly Conservation's Head Office. The best night of the year so far was 13 April when 69 individuals of 13 species were recorded. The usual suspects for this time of year were the most numerous species; Early Grey *Xylocampa areola* (17), Common Quaker *Orthosia cerasi* (14) and Hebrew Character *Orthosia gothica* (11). We also had our first thorns of the year Early and Purple which added a splash of colour to the catch.

Micro-moths count too!

The most significant development for the National Moth Recording Scheme (NMRS) of late is that micro-moth records will now be incorporated in to the NMRS database. This exciting venture has been a long time coming and has required considerable thought and consultation with the existing National Taxa Schemes and micro-moth experts. We have explored several funding avenues, but with none forthcoming, we decided to press ahead anyway using Butterfly Conservation's existing resources and infrastructure.



Oecophora bractella (Patrick Clement)

Although there are many micro species that are distinctive and easily identifiable such as Small Magpie *Anania hortulata*, Mother of Pearl *Pleuroptya ruralis* and Twenty-plume Moth *Alucita hexadactyla*, there are plenty that are difficult to distinguish from similar species, particularly if individuals are worn. Bearing this in mind, it was decided, after discussions with the existing National Taxa Schemes and the key micro-moth experts, that Regional Verification Panels should be established to assist the County Moth Recorder network, as necessary with the important task of verification. In addition to this a 'National' Verification Panel has been established to provide further support to the Regional Panels as and when required. Please be assured that the County Moth Recorders (CMRs) have a critical role in the

verification process and the panels are only there to support the work and verification decisions of the CMRs. The Moths Count team would like to thank everyone who has agreed to sit on the Regional Verification Panels and we look forward to working with you all.

To help ensure that the verification process runs smoothly and that recorders are aware of the possibility of their records being questioned or requiring further evidence to substantiate them, [verification guidance notes](#) and [verification grading criteria](#) (for all micro species) have been compiled by John Langmaid, Stephen Palmer, Mark Parsons and Mark Young. This was a mammoth task and many hours of work went in to producing this documentation. We are incredibly grateful for the support and advice of these individuals. The verification guidance notes and verification grading criteria were circulated to the County Moth Recorder network in early March and are also available to download from the Moths Count website (http://www.mothscount.org/text/73/guidance_notes.html).

As with the macro-moths the only way to ensure that your micro-moth records enter the NMRS is to submit them to your [County Moth Recorder](#). In some vice-counties there are separate macro and micro County Recorders, but in the majority of vice-counties the County Moth Recorder deals with all moth species. For further details and background information about micro-moths and the NMRS please click [here](#).

National Moth Recording Scheme Update

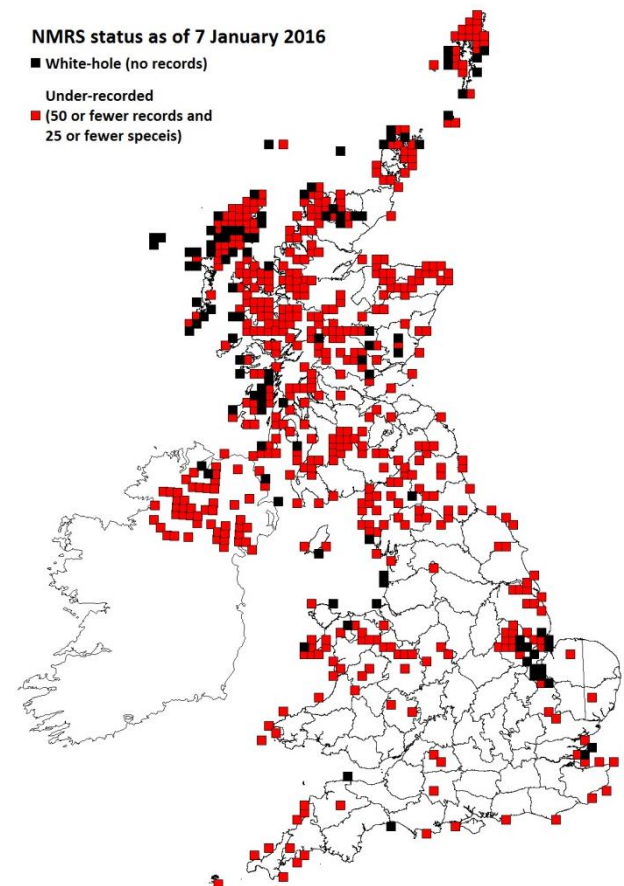
There are currently 20.3 million macro-moth records in the NMRS database. Since January we have received 55 vice-county datasets, which are in a queue awaiting import into the NMRS and will be refreshed as soon as possible. We are really pleased to have received updated datasets from the following vice-counties, as it has been at least 18 months since they were last refreshed; VC 36 Herefordshire, VC 58 Cheshire, VC 59 South Lancashire, VC 60 West Lancashire, VC 72 Dumfriesshire, VC 73 Kirkcudbrightshire and VC 74 Wigtownshire. We thank all of the County Moth Recorders concerned and their dedicated moth recorders for sending in their records.

In recent weeks Les Hill our Database Manager has forwarded the moth data submitted via the official [NMRS online](#) to CMR's. In total 28,137 records for 1,090 species (including micro-moths) were submitted online by 268 recorders. This is the first time this task has been under-taken and as to be expected there were a few initial 'teething' problems. We will be addressing the issues encountered to improve the process for future years.

At the end of this edition of E-moth you can find the most recent list of white-holes and under-recorded 10km squares, based on data in the NMRS as of 7th January 2016. This list will be updated and posted on the Moths Count website in due course. Please remember that your CMR will have more up-to-date information, as it takes a while for us to process datasets, so it is worth checking with them that the squares you plan to target are truly white-holes or under-recorded areas. It is also worth contacting your CMR to find out what the local recording priorities are in your area and where you can make a difference on the local scene. We are really keen to ensure that species distribution maps are as accurate and up to date as possible for the forthcoming Atlas of Britain and Ireland's Larger Moths. The Atlas will include records up to 31st December 2016, thus this is the final field season for moth records to be collected.

With the exception of VC 76 Renfrewshire we currently have a full complement of County Moth Recorders. After a protracted hiatus in Kent we have two new recorders, Ian Hunter for VC 15 East Kent and David Shenton for VC 16 West Kent. A new website has been set up, so to find out what's happening in Kent visit www.kentmothgroup.wordpress.com.

After 30 years' service David Manning has stepped down as County Micro-moth Recorder for VC 30 Bedfordshire and VC 32 Northamptonshire. Andy and Melissa Banthorpe have taken on the micros for Bedfordshire and Mark Hammond has picked up the reins in Northamptonshire. In North Wales, Helen Bantock took on the role of County Micro-moth Recorder for VC 51 Flintshire about a year ago. Last but not least David Wood is the new County Moth Recorder for VC 102 South Eubudes after John Armitage stepped down in the autumn. We would like to thank the outgoing County Moth Recorders for their efforts and for supporting the NMRS over the years. We also thank the new recruits for taking on these vital roles within the moth recording community and we look forward to working with them.



Map showing NMRS white-holes and under-recorded 10km squares from 2000 onwards

Other news from the NMRS is that we are no longer able to produce the annual hardcopy Moths Count newsletter due to limited financial resources. We have also taken the decision to stop issuing Mothy Mutterings, our monthly round up of moth conservation news and summary of the Moth teams activities. To mitigate for this we will be publishing four bigger E-moth updates per year, which will contain articles and information that have traditionally been distributed in the annual Moths Count newsletter and Mothy Mutterings. These E-moth updates will automatically be sent to you via the Moths Count mailing list and will be available to download from the Moths Count website as usual.

National Moth Recorders' Meeting

In January this year we held our sixth National Moth Recorders' Meeting. The event was a great success with 200 people attending. The talks were varied and included the usual update on the National Moth Recording Scheme. We heard from three academic researchers, about moths and climate change, the impact of light pollution on moths, and the use of cyanide by Burnet moths. There was a fascinating talk on the Bordered Grey *Selidosema brunnearia* in Aberdeenshire, an update us on the conservation of Fishers' Estuarine



Moth *Gortyna borelii* and a presentation on the changing fortunes of moths in Yorkshire. At the end of the day speakers from A Focus on Nature, the youth nature network, gave us an insight into the reasons why they are passionate about moths and re-assured us that the future of moth recording is in good hands. The Moths Count team would like to thank all of the speakers and attendees for contributing to one of the annual highlights in the moth recorder's calendar. For those of you who were unable to attend the meeting the talk abstracts are available to view on the Moths Count website to give you a flavour of the day. In addition to this two of the talks have been written up for inclusion in this edition of E-moth and can be found on pages 7&8.

This year we asked attendees to complete a feedback form so that we could review the meeting format, content and venue location and make improvements / changes as necessary. There was a 57% response rate and the results are summarised in the table below. It was pleasing to see that the meeting meets the expectations of the majority, is generally aimed at the right level, the catering and venue location are more than satisfactory and the day is good value for money with just over one-third of people being prepared to pay more for the day. Less than one-quarter of attendees also go to the UK Butterfly Recorders' Meeting and there is some interest in holding a joint moth and butterfly meeting, provided it was held as a day event rather than a two day event which would require overnight accommodation. With these results in mind we have taken the decision to retain the current format of a one day meeting dedicated to moths, to be held at the Birmingham and Midland Institute. There were a few negative comments regarding the lunchtime 'scrum' due to large numbers of people having to congregate in the Dickens Room. We will be making arrangements to have an over-flow room during the lunch break at next year's meeting to get around this problem. A few people complained that the lunch break was too long, however, we extended the lunch period a few years ago in response to people wanting longer to network and catch up with friends. It was unfortunate that we broke for lunch early this year which protracted the lunchbreak further; however, we will reduce the lunchbreak next year to enable the meeting to finish slightly earlier for people to get home earlier.

To streamline the booking process and reduce queuing at the meeting registration desk we are moving to an online booking system, we plan to do this via Butterfly Conservation's website. This new arrangement will require payment at the time of booking – further details will be available in due course. Of course if you do not have access to the internet alternative arrangements can be made on request.

Table 1: Summary of results from the National Moth Recorders' Meeting evaluation.

	Yes completely				No not at all
	5	4	3	2	1
	%	%	%	%	%
Did the meeting meet your expectations?	77	22	1		
Was the meeting content at the right level?	68	25	7		
Was the venue and catering satisfactory?	62	32	5	1	
Was Birmingham a suitable location for the meeting?	81	15	4		
Was the day value for money?	91	9			
Would you be prepared to pay more?	35	28	19	6	8
	£7.50	£10.00	£15.00	£20.00	£20.00+
What is the upper value you would be prepared to pay	%	%	%	%	%
	18	47	21	11	2
	Yes	No			
Do you attend the Butterfly Recorders' meeting?	24	77			
Would you be interested in attending a joint moth and butterfly meeting?	54	46			
Would you attend a joint moth and butterfly meeting hosted over two days?	Yes	No	Maybe		
	32	54	12		

Please make a note in your diaries for next year's meeting which will be held on **Saturday 28th January 2017** at the Birmingham and Midland Institute, central Birmingham. As always, advance booking is essential to secure your place, further details and how to book will be provided in E-moth in due course. We hope that you will continue to support the meeting and will find the new booking arrangements an improvement on the current system.

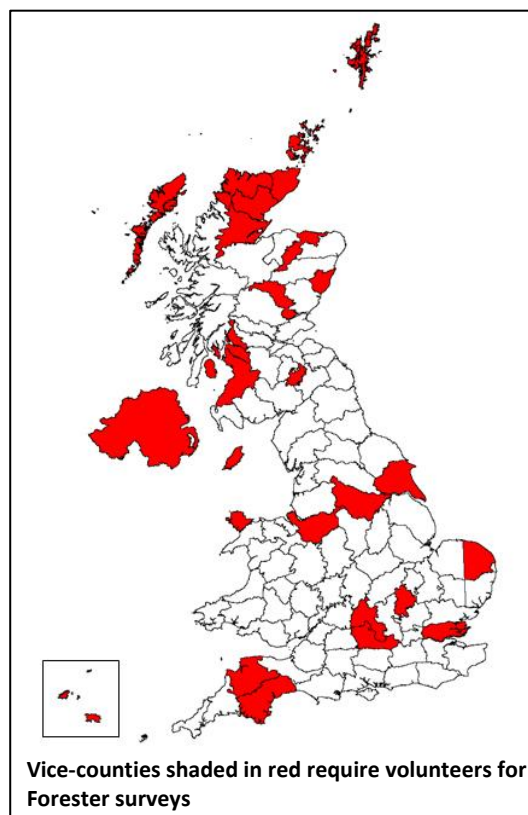
Forester survey using pheromone lures 2016

I am a PhD student at Canterbury Christ Church University looking at developing and utilising pheromone monitoring systems for a number of rare and declining moth species. My supervisor Dr Joe Burman has a background in insect chemical ecology with a particular interest in Zygaenidae.

This summer we are carrying out a UK-wide survey of Forester *Adscita statures* using pheromone lures. Forester distribution declined by 83% between 1980 and 2005 (JNCC, 2010). Species-specific monitoring to gain a better understanding of their distribution and habitat is necessary to assist in the Forester's conservation.

Last year we tested lures developed by Efetov *et al.* which were based on the identified pheromone components of the Plumb Moth, *Illiberis rotundata*. When Efetov *et al.* tested these in the field in Crimea it was found that a number of *Adscita* spp. and *Jordanita* spp. were also attracted to the lures. We were sent some of these lures to test with *Adscita statures* in the UK. We tested the lures in Kent and Andrew Masterman tested them in Argyll with great success – Foresters were attracted to the lures within 15 minutes.

Using this low-effort and powerful monitoring tool we want to carry out a UK-wide survey of Foresters, but to do this we need the help of moth recorders in each county. From the survey we want to map the Forester's distribution across the UK, gain a better understanding of the habitat types across the UK that Foresters are found in and gain a better understanding of the properties of the habitats across the UK that are occupied/unoccupied by Foresters. These are all actions identified in the species' biodiversity action plan that are essential in progressing the Forester's conservation.



For this survey absence data is just as important as presence data. Even if the Forester has never occurred in a county, it is important to sample so that data from all counties has been obtained by the same survey method. To improve understanding of the moth's habitat requirements we need data from where it is absent just as much as where it is present. We have 60 vice counties on board so far (shown as various shades of green on the map) but want to get as many involved as possible.



Forester on pheromone lure (Joe Burman)

In counties where the Forester has been recorded (currently or historically), we ask for lures to be tested at a minimum of one known and one unknown site. Where the Forester has not been recorded we ask that lures are tested at a minimum of two unknown sites. For the unknown sites we simply require that larval food plants, Common Sorrel *Rumex acetosa* or Sheep's Sorrel *Rumex acetosella* are present; by being more prescriptive about the types of habitats that are sampled we would risk biasing the data. If testing unknown sites I would suggest that if you are visiting a site that might contain the larval foodplant, you simply take the lure with you, and if moths are there they will be attracted within 15 minutes.

The process is simple, between 16 June and 30 June just take the lure to the site, once at your chosen spot take out the lure and time 15 minutes and record the number of moths attracted. There is a short checklist to fill out about the site.

We would be very grateful for any help with this survey – the more areas we can cover the more thorough the data set we will obtain and the better an understanding we will gain. If you are interested in taking part, please email me at a.oleander131@canterbury.ac.uk

Ashen Oleander, *PhD student Canterbury Christ Church University*

Conservation updates

The winter months and early spring are usually a quiet time for recording/monitoring moths, although site management does take place. This winter period has been no different, but there continues to be plenty of activity. At the beginning of March we undertook the annual monitoring of the Richardson's Case-bearer *Eudarcia richardsoni* on Portland, Dorset (one of two sites in the UK for this Section 41 Priority species). This involved timed searches for the larval cases at eight fixed points across the island, the cases being found on areas of rocky scree. In total 16 cases were found, with two of the sites returning a zero total and a third site was abandoned by the survey team due to a recent cliff fall (this site replaced by a substitute site nearby). Over the last four years comparable totals (i.e. cases found during the timed counts) have been 2013: 13; 2014: 12; 2015: 16; 2016: 14, indicating a reasonably stable population.



Eudarcia richardsoni case (Mark Parsons)

This monitoring is undertaken as part of Dorset Wildlife Trust's Portland Living Landscapes project which aims to control Cotoneaster growth. Cotoneaster is a threat to some of these scree areas and can lead to a build-up of a humus layer, as well as smothering the scree. Indeed some of the subsites monitored for the moth have had the Cotoneaster controlled with the moth surviving in these areas.

Also in March, and with help from local Forestry Commission (FC) staff, we continued what has now become an annual exercise of planting out about 20 native Barberry bushes in and around the extant Barberry Carpet *Pareulype berberata* (Section 41 Priority species) site in Dorset, these supplied by Ian

Hughes (British & Irish Association of Zoos & Aquariums). This approach has, over the years, established this site amongst the strongest for the moth in the country. This year, in addition to the extant site, we planted bushes in the nearest FC woodland holding (c. two miles from the extant site) and also onto an adjacent farm holding. The plan is to continue to extend the amount of Barberry in the wider landscape over the years to come.

An initial search has been made for cases of *Coleophora wockeella* (Section 41 Priority species) at its sole UK site, a Butterfly Conservation (BC) reserve, in March. Encouragingly seven larval cases were found at various locations, including four during a 1hr timed search. In addition to this, a single case was found on part of the site that was managed by BC to encourage conditions for the moth under a Biffa Award funded project. Another survey was undertaken in April and a further case was found in an area where scrub clearance had taken place c.0.5km from the main site, and additional cases were found on the managed area searched earlier in the year.

A brief summary report has been compiled on the monitoring work undertaken on *Coleophora vibicella* (Section 41 Priority species) at various sites in southern England in 2015. This covered five of the six extant sites. There are various monitoring methodologies used across the sites, including timed counts, transects and full surveys. More than 1,200 cases were counted in total, but only two of the sites had more than 100 cases. This represents a recovery in overall numbers on 2014, but numbers at the three strongest sites were down on 2013. Increased grass growth over the last couple of years and/or reduced grazing pressure may be responsible for these lower counts, but it could also be the time of year the counts were undertaken, as at least one of the counts was undertaken several weeks later than the count at another site and the resultant grass growth making searching for cases more difficult. Either way there are issues relating to management. At one site, 75% of the area had been mown contrary to advice for the conservation of the moth. We have also had a meeting with Natural England (NE) to discuss management for a site supporting this species (albeit in low numbers) and *Agonopterix atomella* (Section 41 Priority species) on the Isle of Wight where the SSSI is assessed for its grassland. Hopefully a suitable compromise has been found and it is anticipated that the moths will be monitored here in the years to come.

In Wales, data for *Anania funebris* have been compiled. This exercise has determined that there are now thought to be 18 sites for the moth, a Section 42 Priority species, in the country. These cover the counties of Monmouthshire, Glamorgan, Carmarthenshire, Pembrokeshire, Cardiganshire and Merionethshire. We have also produced a short article for the Entomologist's Record & Journal of Variation on recent searches for *Agonopterix atomella* (Section 41 & 42) in Monmouthshire, with a brief update of its status in England (see vol. 128: 86-88).

It has been recently reported in the Silurian (the newsletter of the Monmouthshire Moth & Butterfly Group) that the Barred Tooth-striped *Trichopteryx polycommata* has been discovered in Monmouthshire, and that this appears to be the first record for Wales (congratulations to Nick Felstead). We have also received reports of this species in Gloucestershire and West Sussex this year, whilst BC staff accompanied Ashen Oleander (University of Kent) to an East Sussex site, with 21 being recorded. However, the objective of this visit was to find a female so that a pheromone lure could be developed. As a consequence of this visit we hope to have a pheromone lure available next year for assisting with location of further colonies. The same site was visited about two weeks later with a remarkable total of just over 70 being noted.



Stephen Palmer co-ordinated the annual Belted Beauty *Lycia zonaria* (Section 41 Priority species) count at the Lancashire site on 17 April. Twenty people attended, with 22 male and 18 female moths recorded. This is an improvement on last year's total of 21 males and 9 females, but still low compared with other recent years.

Finally, we would like to thank NE and Hampshire & Isle of Wight Wildlife Trust (HIWWT) for securing funding (no mean feat in the current climate) and undertaking management at the site for the Reddish Buff *Acosmetia caliginosa* (Section 41 Priority species) on the Isle of Wight over the last winter. A

substantial amount of scrub has been removed, doubling one area and increasing the size of two other areas. This builds on a positive 2015 for the species, with input from HIWWT, NE, BC, local zoos and several volunteer moth recorders. There are plans for further scrub and tree removal in the next few years, including on adjacent land, but this will be reliant on securing grants.

Moth Night 2016

This year's Moth Night runs from Thursday 9 through to Saturday 11 June. The official theme is Hawk-moths. These large and spectacular insects provide the perfect opportunity to showcase moths and moth recording. The prospect of catching a scarce migrant such as Striped Hawk-moth or searching for conservation priorities such as the Narrow-bordered Bee Hawk-moth are an exciting challenge for the most experienced moth recorder.

Moth Night provides the perfect opportunity to go somewhere new to trap; run a public event; invite friends and family over for a pre-moth trapping barbecue or breakfast whilst inspecting the previous night's catch. With the forthcoming Atlas of Britain and Ireland's Larger Moths, you can use Moth Night as an excuse to target white-holes, under-recorded areas and look for day-flying moths. Seven species of Clearwing are on the wing in early June, these are generally under-recorded, and again Moth Night is timed perfectly for going out with pheromone lures on the search for these elusive species.



Striped Hawk-moth (Mark Parson)

Please submit your Moth Night 2016 records via the easy-to-use online recording system at www.mothnight.info or by MapMate sync file (using the Moth Night 2016 filter). All records submitted via the online system will be repatriated to County Moth Recorders. If you are running a public moth event please advertise it for free [here](#).

The Bordered Grey enigma

Ever since a single Bordered Grey *Selidosema brunnearia* first appeared at St. Cyrus, on the coast of South Aberdeenshire, in 1961, its status there was open to question. It reappeared sporadically, and over the next half century, only five more were found. They would appear as single adults and always with several years between sightings. Given that Bordered Grey has its stronghold on the southern heaths of Dorset and Hampshire, and that most additional records are from the western fringes of England and Scotland, its presence at St. Cyrus on the north-east coast was puzzling, especially as its known food preferences, Heather & Birds-foot Trefoil, don't occur in the section of the reserve where the moth was always found.



Bordered Grey female (Paul Brooks)

In 2013 efforts were made to settle the issue, with the aim of resolving whether the moth was colonising the reserve, or possibly flying in from elsewhere. Moth Night was the catalyst, as August 10th 2013 was within the flight window of the moth. As in past years, a single adult male came to light. However, on August 16th, when a second attempt was made, 10 males were netted in the dune system adjacent to the trapping area. This find was the clearest indication of colonisation to date. June 2014 was therefore targeted as the time to try to prove this beyond doubt, with a search for Bordered Grey larvae.

With the absence of heather and trefoil at the site, Common Restharrow *Ononis repens* which grows there abundantly, was targeted as a possible food source. Though never recorded as the moths' larval foodplant in the UK before, it was known to be an occasional food source on the continent. During three night searches, approximately 35 larvae were found feeding on the Restharrow. Although they were not

the expected colour (possibly a local adaptation is taking place), they did match the description for Bordered Grey larvae in every other way. The larvae were therefore split into two groups, and efforts were made to rear them through.

The larvae eventually pupated towards the end of June, and anticipation grew as July wore on and the impending flight-season grew closer. Just before the month's end, the first of nine male Bordered Greys emerged, and these were followed later by seven of the smaller females, the first ever recorded from St.Cyrus - a wonderful result. Not only was proof of resident population, but a new larval food source for the UK was also proved. It was well worth all the effort.

Do you have a 'Bordered Grey' equivalent in your neck of the woods? Why not try to establish its status locally, and in so doing, add to the ever increasing wealth of knowledge surrounding our wonderful moth populations.

Paul Brooks, *Moth Recorder Angus*

Burnets, cyanide-bombs and colonisation

The Six-spot Burnet *Zygaena filipendulae* is one of a number of moths and butterflies that rely upon chemical defences to ward off would-be predators. The moth's body contains high levels of cyanogenic glucosides - chemical compounds that release hydrogen cyanide when chewed or digested, making the moth extremely unpalatable to predators.

The Six-spot Burnet derives cyanogenic glucosides from their foodplant Bird's-foot Trefoil *Lotus corniculatus* as well as producing some of the compounds themselves from amino acids. The compounds are toxic due to the release of hydrogen cyanide during enzymatic degradation. These compounds and their degrading enzymes are kept apart in plants and insects until predation occurs.

Six-spot Burnet larvae prefer to feed on *Lotus* plants containing high levels of cyanogenic glucosides. We have shown that the compounds are taken up intact by Six-spot burnet larvae, which have evolved several adaptations to avoid degradation of the compounds, namely a high PH in the gut, fast feeding and the use of a leaf-snipping feeding mode.



Six-spot Burnet larva (Mika Zagrobelny)



Six-spot Burnet (Mika Zagrobelny)

In addition to serving as defence compounds, the cyanogenic glucosides have previously been shown to play important roles in the mating process of the moth, since it is used for mate attraction and also transferred to the female during mating.

During the last Ice Age (110,000-12,000 years ago) temperate species were confined to refugia. From here they re-colonised warming northern habitats. In Europe many temperate species have been shown to have inhabited the Iberian, Italian and Balkan peninsulas during the Ice Age. Denmark, the rest of Scandinavia and Scotland were covered in ice until at least 15,000 years ago, resulting in most present day species having arrived in these areas after this time.

I have sequenced a gene from specimens of Six-spot Burnet from different populations across Europe. The resulting evolutionary tree suggests that there are two

major groupings of Six-spot Burnet populations, which could reflect origins from two different refugia.

Interestingly, it seems that these two 'types' of Six-spot burnet only co-occur in Denmark, Sweden and Scotland which could indicate that Northern Europe comprises a "hybridization zone" where individuals from the two different refuges met after the last Ice Age. I have applied for funding to sequence more populations and more specimens to establish from where and when the Six-spot burnet in Northern Europe arrived.

Dr Mika Zagrobelny, University of Copenhagen

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[@savebutterflies](https://twitter.com/savebutterflies)



www.facebook.com/savebutterflies

www.mothscount.org

NMRS White-holes 2000 onwards (data as of 7 January 2016)

10km	VC	VC name
SY38	3	South Devon
SS75	4	North Devon
TR08	18	South Essex
TR19	18	South Essex
TF53	28	West Norfolk
TF30	29	Cambridgeshire
TF30	29	Cambridgeshire
TF40	29	Cambridgeshire
TF40	29	Cambridgeshire
TL39	29	Cambridgeshire
TL39	29	Cambridgeshire
TL49	29	Cambridgeshire
TL49	29	Cambridgeshire
TL58	29	Cambridgeshire
SH13	49	Caernarvonshire
SH76	49	Caernarvonshire
SH76	49	Caernarvonshire
SH59	52	Anglesey
TF13	53	South Lincolnshire
TF14	53	South Lincolnshire
TF21	53	South Lincolnshire
TF23	53	South Lincolnshire
TF32	53	South Lincolnshire
TF54	53	South Lincolnshire
TF45	54	North Lincolnshire
SJ19	58	Cheshire
SD22	59	South Lancashire
SD22	59	South Lancashire
SD23	60	West Lancashire
NY64	70	Cumberland
NY64	70	Cumberland
SD08	70	Cumberland
SC36	71	Isle of Man
NN93	88	Mid Perthshire
NO01	88	Mid Perthshire
NO01	88	Mid Perthshire
NO05	89	East Perthshire
NO07	89	East Perthshire
NO07	89	East Perthshire
NO44	90	Angus
NO46	90	Angus
NN36	97	West Inverness
NN36	97	West Inverness
NS01	100	Clyde Islands
NR51	101	Kintyre
NR87	101	Kintyre
NM60	102	South Ebudes

10km	VC	VC name
NM61	102	South Ebudes
NR16	102	South Ebudes
NR48	102	South Ebudes
NR56	102	South Ebudes
NR57	102	South Ebudes
NR58	102	South Ebudes
NR59	102	South Ebudes
NM16	103	Mid Ebudes
NM21	103	Mid Ebudes
NM23	103	Mid Ebudes
NG13	104	North Ebudes
NG38	104	North Ebudes
NG66	104	North Ebudes
NM19	104	North Ebudes
NM29	104	North Ebudes
NC62	107	East Sutherland
NC62	107	East Sutherland
NC83	107	East Sutherland
NC83	107	East Sutherland
NC16	108	West Sutherland
NC27	108	West Sutherland
NC43	108	West Sutherland
NC43	108	West Sutherland
NC54	108	West Sutherland
NC63	108	West Sutherland
NC63	108	West Sutherland
NC93	109	Caithness
NC93	109	Caithness
NC93	109	Caithness
HW63	110	Outer Hebrides
HX62	110	Outer Hebrides
NA00	110	Outer Hebrides
NA10	110	Outer Hebrides
NA81	110	Outer Hebrides
NA90	110	Outer Hebrides
NA93	110	Outer Hebrides
NB00	110	Outer Hebrides
NB01	110	Outer Hebrides
NB11	110	Outer Hebrides
NB21	110	Outer Hebrides
NB30	110	Outer Hebrides
NB40	110	Outer Hebrides
NB46	110	Outer Hebrides
NB52	110	Outer Hebrides
NB53	110	Outer Hebrides
NF09	110	Outer Hebrides
NF56	110	Outer Hebrides

10km	VC	VC name
NF58	110	Outer Hebrides
NF61	110	Outer Hebrides
NF66	110	Outer Hebrides
NF68	110	Outer Hebrides
NF80	110	Outer Hebrides
NF88	110	Outer Hebrides
NF89	110	Outer Hebrides
NG07	110	Outer Hebrides
NG18	110	Outer Hebrides
NL57	110	Outer Hebrides
NL68	110	Outer Hebrides
NL79	110	Outer Hebrides
HY23	111	Orkney
HY34	111	Orkney
HY35	111	Orkney
HY54	111	Orkney
HY73	111	Orkney
HU14	112	Shetland
HU15	112	Shetland
HU16	112	Shetland
HU30	112	Shetland
HU53	112	Shetland
HU55	112	Shetland
HU66	112	Shetland
HZ17	112	Shetland
J68	H38	Co. Down
D41	H39	Co. Antrim
C52	H40	Co. Londonderry
C61	H40	Co. Londonderry

NMRS under-recorded (50 or fewer records and 25 or fewer species) 10km squares 2000 onwards of 7 January 2016)

10km	# Recs	#Spp	VC
SV90	4	3	1
SW44	30	16	1
SW65	1	1	1
SW81	8	4	1
SS10	2	2	2
SS11	2	2	2
SW95	43	19	2
SX03	18	8	2
SX09	2	1	2
SX14	1	1	2
SS61	17	15	4
ST98	31	20	7
SU07	28	22	7
ST93	28	20	8
SY87	32	19	9
SZ28	14	14	10
SZ99	28	23	13
TV69	28	17	14
TR07	9	7	15
TR12	10	9	15
TR27	8	6	15
TR33	1	1	15
TR47	2	2	15
TM00	21	9	18
TQ98	29	20	18
TL54	28	6	19
TL63	6	4	19
TM16	15	12	25
TF82	8	8	28
TL48	10	5	29
SO35	20	17	36
SO64	5	5	36
SJ81	13	11	39
SK03	7	4	39
SK12	5	4	39
SJ33	11	11	40
SJ42	21	19	40
SJ50	3	3	40
SJ52	14	11	40
SJ62	9	4	40
SM50	3	3	45
SM62	11	4	45
SM71	40	23	45
SM84	11	7	45
SN36	2	2	46
SN59	14	12	46
SN87	3	3	46

10km	# Recs	#Spp	VC
SJ00	36	24	47
SN99	6	4	47
SH51	11	10	48
SH60	15	12	48
SJ04	23	19	48
SH12	41	15	49
SH22	23	21	49
SH23	3	3	49
SH24	2	1	49
SH32	13	11	49
SH43	1	1	49
SH44	39	24	49
SH65	7	7	49
SH86	1	1	50
SH94	6	6	50
SH95	48	20	50
SJ14	13	9	50
SJ23	49	25	50
SJ26	13	11	51
SH29	2	2	52
SK83	21	18	53
SK93	1	1	53
SK94	2	2	53
SK95	6	5	53
TF03	5	5	53
TF04	3	2	53
TF05	3	3	53
TF06	28	23	53
TF12	3	3	53
TF43	3	1	53
TA01	7	5	54
TA11	3	3	54
TA21	3	3	54
TA40	3	3	54
TF25	24	19	54
TF29	5	5	54
TF34	2	2	54
TF39	5	4	54
TF44	15	15	54
TF48	20	18	54
SD35	17	17	60
SE87	17	13	61
SE97	6	6	61
TA22	1	1	61
TA33	1	1	61
TA25	1	1	61
TA42	1	1	61

10km	# Recs	#Spp	VC
NZ72	40	18	62
NZ91	18	10	62
OV00	1	1	62
SD94	28	17	63
NZ00	30	13	65
NZ11	34	14	65
NY94	4	4	66
NZ12	5	5	66
NZ32	26	14	66
NZ45	21	20	66
NT80	23	8	67
NY75	1	1	67
NY79	2	2	67
NY84	11	11	67
NZ07	2	2	67
NZ08	10	8	67
NZ38	10	7	67
NZ39	2	2	67
NT81	5	5	68
NT91	4	4	68
NU05	9	7	68
NY41	27	19	69
NY50	6	6	69
NY71	3	3	69
NY72	12	12	69
NY81	2	2	69
SD16	12	10	69
NX90	2	2	70
NX92	20	10	70
NX93	14	4	70
NY00	7	5	70
NY03	16	7	70
NY04	23	12	70
NY05	10	10	70
NY12	27	18	70
NY14	3	3	70
NY20	45	25	70
NY34	2	2	70
NY36	2	2	70
NY43	3	3	70
NY46	13	10	70
NY57	2	1	70
NY58	8	6	70
NY67	16	9	70
SD09	21	12	70
SD19	48	19	70
SC17	1	1	71

10km	# Recs	#Spp	VC
SC47	1	1	71
NS71	7	7	72
NT10	22	13	72
NT20	24	22	72
NY28	1	1	72
NX54	31	18	73
NX59	20	15	73
NW97	25	18	74
NX03	32	19	74
NX27	20	11	74
NX33	37	23	74
NS00	6	5	75
NS14	17	10	75
NS22	1	1	75
NS50	47	18	75
NS51	2	2	75
NS52	28	22	75
NS60	4	4	75
NS61	7	5	75
NS62	9	6	75
NX09	38	21	75
NX18	6	6	75
NX28	24	13	75
NX29	7	6	75
NX39	29	15	75
NS63	33	13	77
NS72	5	4	77
NS73	8	6	77
NS82	7	6	77
NS90	21	16	77
NS91	23	19	77
NS93	29	20	77
NT05	1	1	77
NT71	10	8	80
NY49	24	19	80
NT16	15	15	83
NT35	4	4	83
NO00	1	1	85
NO61	9	9	85
NT39	18	17	85
NT59	4	4	85
NS68	34	21	86
NN43	4	4	88
NN44	3	2	88
NN56	11	7	88
NN61	6	6	88
NN64	35	18	88
NN66	1	1	88
NN73	1	1	88

10km	# Recs	#Spp	VC
NN83	1	1	88
NN84	5	5	88
NN92	11	11	88
NN94	4	4	88
NN67	17	14	89
NN77	3	3	89
NN87	3	3	89
NN97	5	5	89
NO13	8	8	89
NO15	1	1	89
NO45	3	2	90
NO74	1	1	90
NO26	1	1	90
NO34	12	12	90
NO58	14	9	91
NO77	7	6	91
NO87	15	7	91
NJ20	19	10	92
NN99	7	5	92
NN98	2	2	92
NJ43	6	5	93
NJ52	28	23	93
NJ53	5	4	93
NJ63	16	9	93
NJ64	1	1	93
NJ74	2	2	93
NJ75	1	1	93
NJ85	10	9	93
NJ86	30	14	93
NJ95	36	21	93
NJ96	6	3	93
NK04	14	12	93
NK06	15	11	93
NK14	12	10	93
NK15	9	6	93
NJ10	12	11	94
NJ22	17	14	94
NJ33	15	13	94
NJ34	19	14	94
NJ15	31	23	95
NJ16	34	20	95
NJ17	16	9	95
NJ24	25	23	95
NJ25	27	19	95
NJ27	15	15	95
NJ35	22	15	95
NH12	23	21	96
NH40	11	10	96
NH50	26	21	96

10km	# Recs	#Spp	VC
NH61	9	7	96
NH62	12	9	96
NN57	33	23	96
NG80	7	4	97
NG90	7	6	97
NH00	3	2	97
NM47	3	3	97
NM57	3	2	97
NM65	13	13	97
NM67	19	12	97
NM68	26	24	97
NM69	24	18	97
NM74	14	10	97
NM75	5	4	97
NM77	3	3	97
NM78	2	2	97
NM87	1	1	97
NM88	10	10	97
NM89	5	5	97
NM96	28	14	97
NM98	14	11	97
NM99	35	17	97
NN09	13	10	97
NN26	4	3	97
NN27	26	22	97
NN29	21	14	97
NN38	24	22	97
NN39	7	6	97
NN47	7	5	97
NN58	22	22	97
NM72	35	18	98
NN05	19	12	98
NN12	14	10	98
NN20	12	9	98
NN21	12	9	98
NN34	11	8	98
NN35	17	8	98
NR96	6	5	98
NR98	3	1	98
NR99	11	9	98
NS09	3	3	98
NS17	16	11	98
NS19	18	14	98
NS29	4	4	99
NS38	28	24	99
NR84	11	11	100
NR93	24	14	100
NR82	1	1	100
NR94	17	15	100

10km	# Recs	#Spp	VC
NR50	4	4	101
NR60	11	9	101
NR61	22	19	101
NR67	1	1	101
NR70	4	4	101
NR72	3	3	101
NR74	2	2	101
NR75	23	18	101
NR63	1	1	101
NR15	45	21	102
NR34	28	12	102
NR37	23	15	102
NR44	6	5	102
NR46	2	1	102
NR47	16	6	102
NR68	6	4	102
NR69	5	5	102
NM40	3	3	102
NR38	16	11	102
NM05	1	1	103
NM33	28	4	103
NM41	9	6	103
NM51	6	3	103
NG20	36	22	104
NG23	9	4	104
NG25	5	4	104
NG26	18	15	104
NG31	3	3	104
NG32	21	15	104
NG34	10	8	104
NG35	17	16	104
NG37	2	2	104
NG40	7	7	104
NG41	10	9	104
NG43	23	21	104
NG45	23	18	104
NG46	23	19	104
NG50	9	6	104
NG51	15	9	104
NG54	20	18	104
NG55	2	2	104
NG60	15	11	104
NG61	18	13	104
NG63	13	8	104
NG65	5	5	104
NM37	1	1	104
NM38	1	1	104
NM59	1	1	104
NB90	15	8	105

10km	# Recs	#Spp	VC
NB91	27	16	105
NC00	5	4	105
NC11	19	10	105
NG64	9	7	105
NG84	10	8	105
NG86	3	1	105
NG93	35	21	105
NG94	9	7	105
NG95	8	7	105
NG98	15	14	105
NH02	5	4	105
NH03	1	1	105
NH04	3	3	105
NH05	12	8	105
NH07	3	3	105
NH17	16	12	105
NH28	11	10	105
NG79	2	2	105
NH13	8	5	106
NH14	8	8	106
NH24	9	8	106
NH29	4	2	106
NH38	5	5	106
NH97	1	1	106
NC32	9	6	107
NC72	17	3	107
NC73	5	5	107
NC03	29	16	108
NC15	3	3	108
NC21	18	10	108
NC23	41	25	108
NC24	3	3	108
NC26	23	16	108
NC33	9	9	108
NC34	2	2	108
NC35	1	1	108
NC36	5	4	108
NC37	1	1	108
NC44	10	5	108
NC45	2	2	108
NC53	7	6	108
NC64	2	2	108
NC65	8	7	108
NC66	28	21	108
ND33	34	23	109
ND07	17	14	109
HW83	13	6	110
NA91	1	1	110
NA92	4	4	110

10km	# Recs	#Spp	VC
NB02	6	4	110
NB03	18	9	110
NB10	10	7	110
NB12	21	17	110
NB13	7	2	110
NB14	16	9	110
NB20	2	2	110
NB22	2	2	110
NB23	2	2	110
NB24	12	12	110
NB31	2	2	110
NB32	10	9	110
NB33	8	4	110
NB34	1	1	110
NB35	2	2	110
NB41	2	2	110
NB42	1	1	110
NB44	2	2	110
NB45	1	1	110
NB55	3	3	110
NB56	3	3	110
NF67	12	1	110
NF82	4	2	110
NF96	7	4	110
NF97	1	1	110
NF98	6	4	110
NF99	2	2	110
NG08	3	2	110
NG09	10	6	110
NG19	27	21	110
NG29	1	1	110
NL58	5	3	110
NL69	10	5	110
NF95	1	1	110
HY10	15	10	111
HY33	3	3	111
HY43	6	4	111
HY45	1	1	111
HY51	6	3	111
HY52	11	10	111
HY55	5	4	111
HY60	1	1	111
HY61	22	12	111
HY62	28	22	111
HY63	3	3	111
ND19	6	3	111
ND28	14	13	111
ND38	48	20	111
ND47	16	12	111

10km	# Recs	#Spp	VC
ND59	3	1	111
HP40	3	3	112
HP50	31	24	112
HP51	8	7	112
HT94	2	2	112
HU24	28	20	112
HU25	22	15	112
HU26	15	14	112
HU28	4	3	112
HU33	10	7	112
HU34	45	25	112
HU38	26	19	112
HU39	2	2	112
HU40	10	7	112
HU48	16	11	112
HU49	5	5	112
HU56	11	10	112
HU57	2	2	112
HU58	10	9	112
HU59	21	15	112
HU67	5	2	112
HU68	2	2	112
HZ16	1	1	112
HZ26	1	1	112
C30	2	2	VCH NI
C41	28	21	VCH NI
C70	15	13	VCH NI
C71	28	25	VCH NI
C72	14	12	VCH NI
C84	9	6	VCH NI
D02	28	24	VCH NI
D24	1	1	VCH NI
D32	18	17	VCH NI
D40	8	3	VCH NI
G94	7	4	VCH NI
G96	4	3	VCH NI
H03	29	14	VCH NI
H08	8	1	VCH NI
H12	11	11	VCH NI
H18	14	9	VCH NI
H22	22	18	VCH NI
H25	17	17	VCH NI
H26	6	6	VCH NI
H27	30	16	VCH NI
H28	3	3	VCH NI
H35	24	20	VCH NI
H36	5	5	VCH NI
H37	33	19	VCH NI
H42	14	11	VCH NI

10km	# Recs	#Spp	VC
H45	24	13	VCH NI
H46	3	3	VCH NI
H49	11	8	VCH NI
H54	26	18	VCH NI
H55	12	7	VCH NI
H59	3	3	VCH NI
H66	32	13	VCH NI
H69	10	7	VCH NI
H74	20	20	VCH NI
H76	31	12	VCH NI
H77	29	22	VCH NI
H79	26	25	VCH NI
H82	26	10	VCH NI
H83	12	7	VCH NI
H91	8	8	VCH NI
H92	13	11	VCH NI
H93	12	8	VCH NI
H94	29	24	VCH NI
J07	5	3	VCH NI
J12	3	3	VCH NI
J13	2	2	VCH NI
J14	19	15	VCH NI
J15	12	8	VCH NI
J22	41	18	VCH NI
J24	4	4	VCH NI
J28	22	15	VCH NI
J31	21	4	VCH NI
D03	7	7	VCH NI
H17	6	1	VCH NI
H53	2	2	VCH NI
J67	5	5	VCH NI