

## Where have all the Small Tortoiseshells gone?

By Malcolm Hull

Results from the Big Butterfly Count have highlighted a decline in the numbers of Small Tortoiseshell butterflies. This year around 100,000 records were collected from across the UK during the period 20<sup>th</sup> July – 12<sup>th</sup> August. These showed that Small Tortoiseshell had fallen by 32% since 2017 and is now only the tenth most observed species, down from 4<sup>th</sup> in 2014. The decline is most acute in England and the reasons for the slump are not clear. No such concerns were expressed about the Peacock, which was the fourth most commonly spotted butterfly.

### What Might Cause This Decline?

Concerns about declines in Small Tortoiseshell numbers are nothing new. In Herts & Middx, its numbers fell dramatically in the late 1990's, remained low for a decade and only showed any sustained recovery after 2012. The species is quite susceptible to parasites and particular concern has been expressed about *Sturmia bella*, a non-native species whose arrival in the UK appears to have coincided with the Small Tortoiseshells decline.

I am lucky enough to have Small Tortoiseshells and Peacocks regularly in a shed which forms part of my house. This state of dormancy is usually referred to as hibernation. My casual observations were that a good many Small Tortoiseshells go into hibernation before the Big Butterfly Count has started and that nowadays most of both species are hibernating before the Count is finished. However most butterfly text books tell a different story "*in Autumn, (Small Tortoiseshells) begin to search for hibernation sites, as early as mid-August.*" (Emmet & Heath). Butterfly behaviour can often change over time, but this view is still widely held – both Small Tortoiseshells and Peacocks "*come in during late summer/early autumn*" according to the December 2018 issue of the All Aflutter E-Newsletter from Butterfly Conservation.



*Small Tortoiseshell hibernating in section 2 of the Transect*

## The Shed

To test this theory, I set up a transect within a part of my house, known as the shed or cellar. The house is located in suburban St Albans. It's an early 20<sup>th</sup> century brick built structure, constructed to restrict heat gain. The shed is on the ground floor, unheated and with approximate dimensions of 3 meters by 1.5 meters. It is used purely for storage, is unheated and has no electric light. It also has little natural light and two small "arrow slit" type windows which contain no glass. The walls are substantial and it is protected from solar gain by a first floor attic area. It seems highly attractive to hibernating Small Tortoiseshells and slightly less so to Peacocks. No other butterfly species have been recorded in the shed.



*St Albans House with "Shed" on left*



*Close-up of "Arrow slit" windows*

## Overall Results

Numbers of hibernating butterflies recorded in the shed each year is quite variable.

Year	Small Tortoiseshells	Peacocks	Total
2018/9	13	3	16
2017/8	23	0	23
2016/7	35	1	36
2015/6	17	2	19
2014/5	14	6	20
2013/4	28	1	29
<b>Average</b>	<b>22</b>	<b>2</b>	<b>24</b>

*Table 1: The maximum numbers of butterflies recorded hibernating in the shed in recent years*

Regular transects have been running only since July 2016. But casual observations go further back. For example my earliest complete record, for the winter of 1995/6 shows 6 Small Tortoiseshells and 1 Peacock. Although I don't have records from each individual year, the overall totals of hibernators in the last six years have been well above the average for the previous two decades.

## Hibernation Period - Entrance and Emergence Times

My records from 1995 showed that the sole Peacock left hibernation on 19<sup>th</sup> March and its successor went into hibernation between 3<sup>rd</sup> and 17<sup>th</sup> September. For many years I imagined that hibernation

took place at the start and the end of the butterfly season. Historically that may have been correct, but regular transects over the last 30 months have produced some interesting results.

- Small Tortoiseshells can start to emerge in February, depending on weather conditions. Their emergence is staggered, but mostly complete by the third week of April.

In the early warm Spring of 2017, Small Tortoiseshells began emerging in early February and had largely all flown by the first week of April, a period of 8 weeks. In 2018, Spring got off to a cold start with two snowfalls in a very cold March. This was followed by a very warm April with the hottest ever UK April temperature recorded on 20<sup>th</sup> April. Small Tortoiseshells didn't begin to emerge until 30<sup>th</sup> March and had all flown by 20<sup>th</sup> April, a period of just 3 weeks.

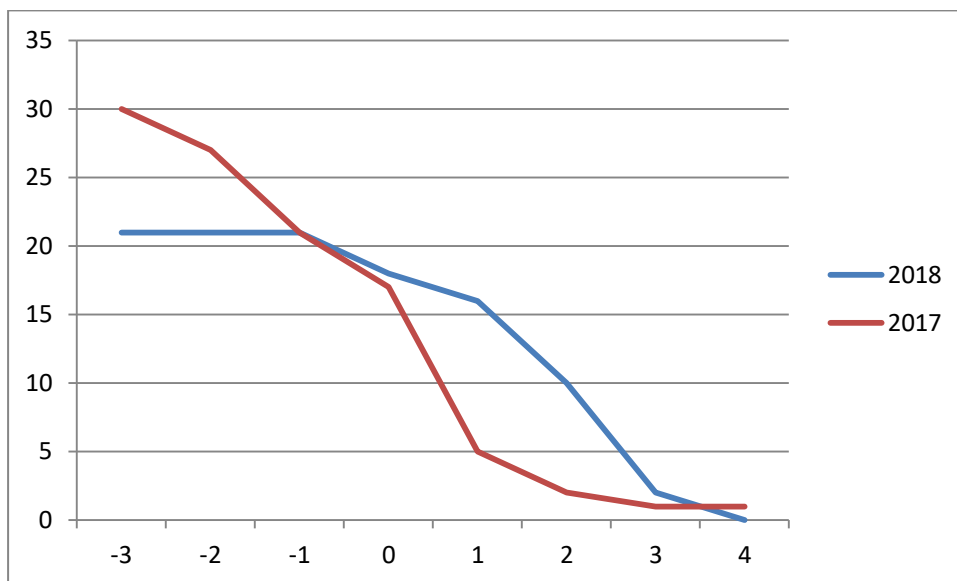


Fig 1: Small Tortoiseshell emergence by Transect Week

- The next generation of Small Tortoiseshells can start going into hibernation as soon as late June. Going into hibernation can be staggered over a considerable period, sometimes lasting until October.
- Hibernation dates are highly variable. In 2017 all the Small Tortoiseshells were hibernating by 7<sup>th</sup> July. In 2018 hibernation was complete by 5<sup>th</sup> August. But in 2016 the last five did not enter hibernation until mid October.

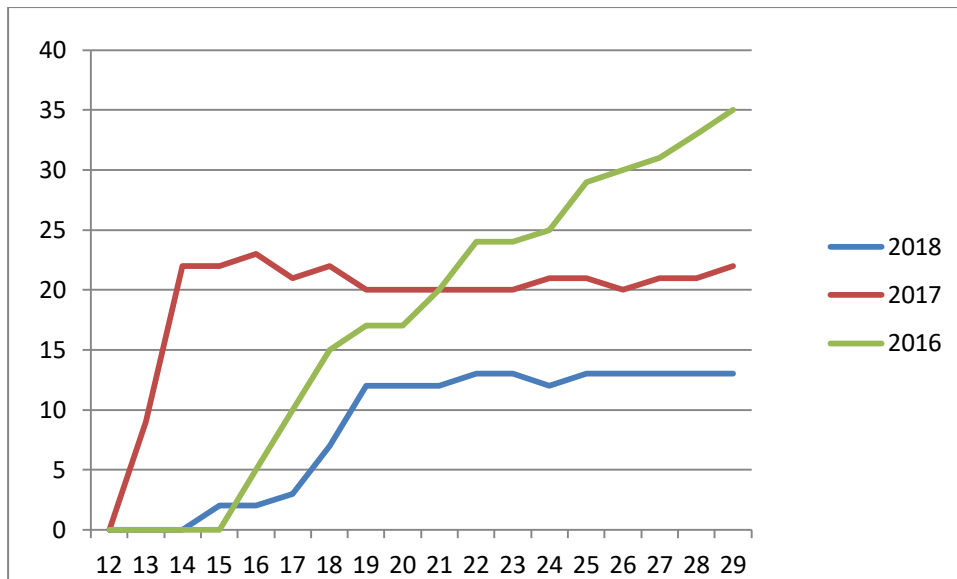


Fig 2: Small Tortoiseshell hibernation, by Transect Week

Data on Peacock behaviour is less plentiful. Lower numbers attempt hibernation in the shed, they seek darker recesses than many of the Small Tortoiseshells and appear to be less successful at surviving. Tentative conclusions are

- Peacocks are more predictable in timing their hibernations, mostly entering during the last week of July or the first week of August.
- Peacock emergence dates also appear more consistent, most recorded being from mid March until mid April.

### How Hibernating Butterflies Behave

For most of the time hibernating butterflies will be perched, usually upside down with their wings folded. Some will remain motionless for the whole period, but sometimes there can be signs of activity.

- The Peacock hiss – by far the most dramatic comes from the Peacock if it is disturbed. Suddenly opening its wings wide, it appears as though two large eyes, the size of an owl are staring at you from a dark corner. The visual shock is accompanied by a loud hissing noise reinforcing the impression you have disturbed an angry bird. I felt quite scared when I saw this and it must be terrifying for a mouse or another potential butterfly predator. Although spectacular, the butterfly uses up valuable energy reserves, so it's best not to get too close. I use a low powered torch for my transect, which is sufficient for me to ID the species without causing disturbance.
- Shuffling – Small Tortoiseshells are particularly prone to this. Over time they will move slightly sideways away from any source of light. The joists in the ceiling provide shelter from the light and they will move to try and get into the darkest safe position
- Sudden Death – Spiders are the main threat in the shed and there are quite a lot of them. At least 90% of butterflies survive, but there are a few losses each year. Peacocks seem more vulnerable. I have seen butterflies covered in cobwebs like mini-shrouds. And others with just the wings left and the body eaten.

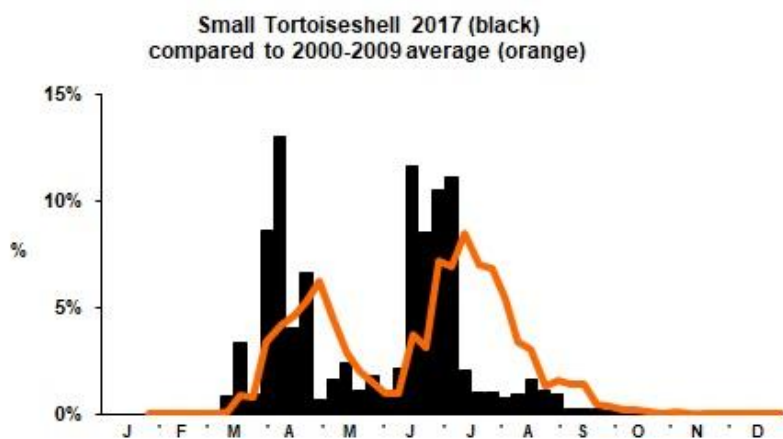
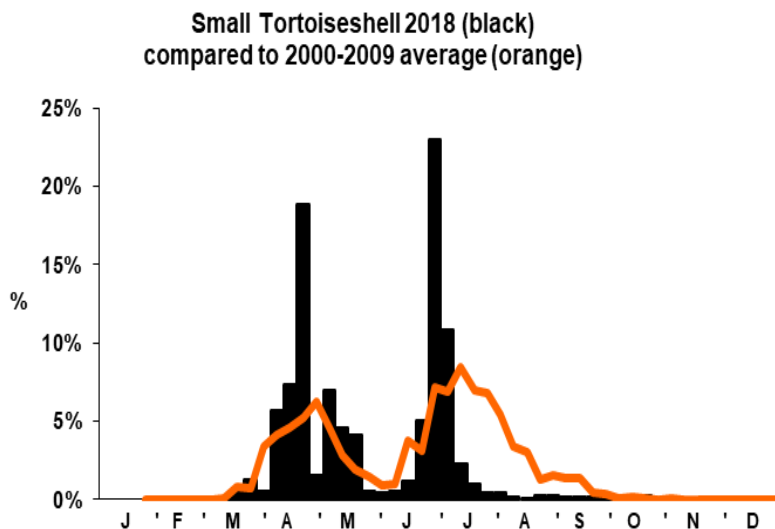
- Moving in – On entry to the shed, a Small Tortoiseshell will fly at a very slow speed, as if in first gear searching out a suitable spot by flying into each nook and cranny. Generally they start up by the ceiling, work round the room and then drop down if no spot appeals. A lot go under the shelves – these are dark and often have less cobwebs than the underside of the ceiling.
- Favourite positions - I divided my transect into three sections to monitor location preferences. So far the underside of the ceiling is most popular with Small Tortoiseshells. The underside of shelves is next most popular. The third area around the door frame is least favoured – probably as it gets most light when I open the door. But Peacocks prefer the underside of shelves – perhaps because it is darker with less spiders.
- Fancy a Day Out? – Once a butterfly is in hibernation, it usually stays there for 7-10 months. Occasionally I notice one or two are missing. This will usually be because they have changed positions or been predated. But occasionally one will leave hibernation on a hot day, feed up on flowers and then head back into hibernation, often in a similar position to before. Butterfly experts often ask if aestivation is the cause of apparent early hibernation. This phenomenon occurs when butterflies are sheltering from extreme heat. I've tested for this by varying the time of day and external weather conditions when the transect is "walked". The weather from day to day does not appear to have any impact on the numbers of butterflies recorded.
- Time to fly! – The most observed behaviour is seeing butterflies eagerly nectaring on flowers in the back garden – primrose and aubrietia are early Spring favourites. I once saw a Small Tortoiseshell purposefully seek out the pond and drink water for 5 mins before tackling a flower. 9 months hibernation must make them feel pretty dry. The most curious emergence behaviour is from those who don't quite get it right. They generally end up perched on my back door or the door mat, unable to fly from lack of warmth/energy and leaving them very vulnerable to attack.



*Peacocks hibernating in Section 3 of the transect*

## Comparison to Other Locations

I am not aware of any other regular hibernation records, so I have compared my findings with data of butterflies seen on the wing. Data from the local branch of Butterfly Conservation is published in an Annual Report, covering Hertfordshire as well as North, West and Central London.

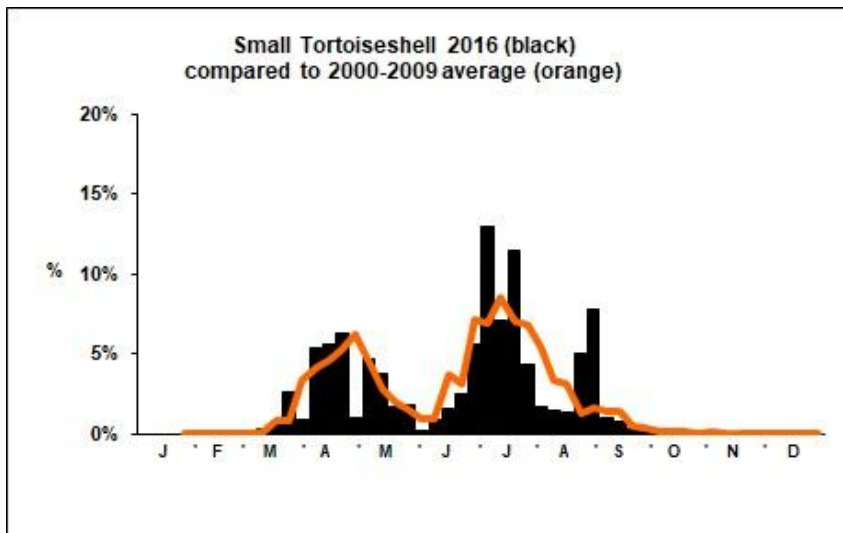


Source: *Hertfordshire & Middlesex Butterflies 2017* by Andrew Wood

The 2017 data (black bars) shows very few Small Tortoiseshells were seen on the wing after the first week of July. This would imply that most were in hibernation by that time. This ties in with my observations and suggests that early hibernation was the dominant trend across all or the majority of the two counties.

In contrast, the average count from 2000-2009 (Orange line) shows that during that period the butterfly flew in much in greater numbers in July and well into August. Although there are signs of a possible second generation in August during this decade, its numbers are low. An alternative explanation for this small peak is that it is caused by Small Tortoiseshells emerging briefly from hibernation for a late summer feed (behaviour which I have observed).





Source: Hertfordshire & Middlesex Butterflies 2016 by Andrew Wood

The corresponding report from 2016 presents a somewhat different picture. First generation individuals were on the wing in numbers until late July. There was a distinct second brood in the second half of August.

Again there is correlation with my data, with an initial burst of Small Tortoiseshells entering hibernation in mid/late July and a significant number added in late August & September.

I suspect the same is happening in Dorset and quite possibly much of southern England. The Big Butterfly Count results from 2018 particularly cite a decline in Small Tortoiseshells in England during the Count period

### Conclusions

Small Tortoiseshells are now routinely going into hibernation much earlier than generally acknowledged. In 2017 most local Small Tortoiseshells in my area of St Albans were hibernating well before the Big Butterfly Count had begun. In 2018, entry into hibernation was largely complete by the end of the first week of the Count. Had it not been for an exceptionally cold March, the Small Tortoiseshells flight period would probably have finished earlier. There has not been a second generation of Small Tortoiseshells of any size in the St Albans area in either 2017 or 2018..

The records of just two years can hardly be said to constitute a trend. The prospect for a future increase in Small Tortoiseshells on the Count will depend on the species producing a second generation, which it did as recently as 2016. Total numbers of Small Tortoiseshells hibernating in my shed over the last six years are encouraging, suggesting that the species may be prospering by adjusting its flight season.

Whether it is hibernating earlier as a way of avoiding parasites, or as a response to climate change, or as a result of an influx of migrants is not really known. Some sources suggest that the parasite is most active during July. It attacks the Small Tortoiseshells when the caterpillars are at a juvenile stage, so it is possible that the first brood caterpillars which are active in late April and May are

relatively safe, whereas second brood caterpillars active in the summer are more vulnerable. Restricting themselves to a single brood and going into hibernation at an early stage during the Summer, could be the Small Tortoiseshells response.

One shed on its own can give an indication but certainly not the complete picture. It would be really useful if other volunteers are willing to keep records based on the UK Butterfly Monitoring Scheme transect methodology. The average transect walk takes just 5 minutes. If anyone reading this article is willing to help, please do get in touch.

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