

Sheepdrove Organic Farm / Elm Farm Research Centre
Research at Sheepdrove Organic Farm

Lepidoptera – A Baseline Study



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Final Report

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Sheepdrove Organic Farm



1. Abstract

The first baseline study of Lepidoptera at Sheepdrove Organic Farm employed a nationally-recognised standard butterfly survey method, as used by the organisation 'Butterfly Conservation.' Sampling took place during April to September 2003 along a 10-section transect totalling 2km, through a variety of habitat.

The sampling recorded a good range of 22 butterfly species, including notably Adonis Blue, and a new species for Sheepdrove's lists – Small Copper. There were 21 butterfly species recorded on the sampling transect, Orange Tip was recorded off-transect, and 3 species of moth were recorded along the transect route - Cinnabar, Silver Y, and Six-Spot Burnet. The greatest variety of species was observed at the transect section with most varied habitat, but the same zone did not support the highest butterfly counts. Different transect sections had distinct variation in butterfly numbers recorded overall. It was noted that sections with the highest counts had greater wildflower densities. (not quantified)

Observations reflect the importance of conservation efforts to support butterflies. The report recommends organic and other wildlife-friendly practices, and more specifically to conserve the prime breeding habitats rich in both host plants and wildflower nectar sources.

2. Objective

To provide a benchmark view of the species of butterflies and moths present at Sheepdrove Organic Farm, using repeatable, well-known methods to produce a set of results which can be referred to, and compared in future.

3. Background

This project deals with a prominent group of wildlife noticed by visitors and important to the general public. Sheepdrove's developments in farming methods and changes in land use may affect the survival of different species of Lepidoptera, over the long term. A study of the current Lepidoptera communities was needed to establish a baseline set of data.

4. Methods

4.1 - Butterflies.

The standard Butterfly Survey method employed by Butterfly Conservation was used for sampling butterfly species. These surveys take place along a walked transect, during 26 weeks between April 1st and the end of September.

The selected transect route covered 2km, comprising 10 sections of 200 metres length, and usually took between 1.5 and 2 hours to complete. A habitat survey of the butterfly transects was done in spring. Some species were photographed with a digital camera, but this was not usually possible during sampling.

Dedicated 'Transect Walker' software supplied by Butterfly Conservation was employed for the butterfly data, (downloaded with survey instructions and documents free from their website www.butterfly-conservation.org) and the major tables generated were exported into Excel for easier future use. Graphs were generated in both software packages.

Because the sampling methods are nationally-recognised and quite straightforward, this project approach will be repeatable. The survey methods could be repeated annually to establish long-term monitoring and the computerised spreadsheet can be expanded each year to enable year-by-year analysis of results. Lepidoptera are a commonly monitored wildlife group, so Sheepdrove results can be compared relatively easily with other sites too.

4.2 - Moths.

By the time a moth trap was obtained, the season for moths was too far advanced to obtain a good baseline study. Therefore this part of the project could not be done due to the delay in approval for the expenditure on this project. Late summer data could have been collected but there was also the issue of a lack of available staff time.

Using a popular and effective moth trap (Robinson Trap), sampling is now planned to take place monthly from April to September 2004 for 3 sampling positions. These positions are: a) Sheepdrove Farmhouse Courtyard; b) Field W13 Owl Box Field; c) Nut Wood.

Assessment of habitat local to the moth trap positions should be carried out on the trapping dates. Specimens will normally be identified on the spot, with any difficult specimens kept for detailed examination or expert opinion at a later date. Photographing specimens with a digital camera will add value to the data and the project report.

Butterfly Survey 2003 - Transect Details Sheepdrove Organic Farm

Section No:	OS Grid Ref	Section Length (m)	Habitat Summary
1	SU352818	200	Unimproved, ungrazed chalk grassland byway. Line of 5m-wide transect next to mixed broadleaf hedge. Bordering the wide byway on both sides is organic farming, with cereal to the North-West and Grazing to the South-East. The byway has rough grass including sheep's fescue and tussocked cocksfoot, with wildflowers such as greater knapweed, lady's bedstraw, and occasional nettles and thistle.
2	SU353819	200	Unimproved, ungrazed grassland on byway, next to farmland. Non-organic farming nearby to one side and organic on the other. The byway has rough grass including sheep's fescue and tussocked cocksfoot, with wildflowers such as greater knapweed, lady's bedstraw, and occasional nettles and thistle.
3	SU355820	200	Unimproved chalk grassland on byway next to grazed improved ley. Some scrub or remnant hedge at fenceline. Rough wildflower-rich unmown and ungrazed, has occasional nettles, thistle and docks.
4	SU357822	200	Unimproved chalk grassland on byway, not grazed, rich in wildflowers with rough grass and occasional thistle, dock and nettles. Not far from newly-extended woodland plantation.
5	SU359823	200	Ungrazed chalk grassland along byway has an increasing amount of nettle and thistle, coming to dominate habitat on the North-West side of the transect. There is non-organic oilseed rape grown in the field to the North-West and organic grazing in the field to the South-East.
6	SU360820	200	Path through mature ash woodland with hazel coppice, also elder, sycamore, cherry, willow and oak. Bluebells widespread in understorey, bramble and nettles abundant, other flowers include cow parsley, red campion and wood avens. Section begins close to recently created lake and reedbed system.
7	SU359819	200	This section begins in mature ash woodland with hazel coppice, along a cleared track, then goes through a grazed field before passing allotments and ends on a flower-rich chalk grass bank. The bank is sheltered by young woodland, faces South-East and is opposite the gardens of a short row of houses.
8	SU357818	200	Sampling occurs on a bank of chalk grassland that faces South-East and is sheltered by an immature shelterbelt of Scots pine and beech. Opposite the bank is a row of household gardens.
9	SU357816	200	Following the mown grass verge of the road to the farm offices, the transect passes mature woodland and a larch plantation, then organic pasture.

10	SU356814	200	At the start of the section there is unmown grass rich in herbs and clovers, then the route goes into a young tree plantation which has a rough grass understorey. Thistles were frequent in the tree plantation. Nearby fields were organic cereal and grazed ley.
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5. Key Results

- Small Copper, a butterfly previously unrecorded at the farm, has been added to Sheepdrove's Species List as a result of this project.
- The Adonis Blue record is important, as a UK BAP Species (Biodiversity Action Plan). While the records of Adonis Blue ought to be considered "unconfirmed" due to observer inexperience, a local Butterfly Conservation recorder did support the Biodiversity Officer's record of this species in 2002.
- The data from the weekly sample visits are summarised in Table 1 – *Table of Observations for the 2003 Season*. To see how the data fits for each of the 10 transect sections, the totals are rearranged into Table 2 – *Totals for the 10 Transect Sections*.
- There were a total of 1902 butterflies recorded during the study, of 22 species.
- The sample showing the highest number of butterflies was during Week 14, with a total of 466 butterflies counted. In contrast some samples at the start and end of the season gave very low numbers or no records.
- Graph 1 illustrates the patterns in recorded numbers during the 2003 season.
- Peaks in numbers varied for different species. Graphs 2a – 2d show this for some of the major species recorded.
- Records for different species are obviously varied, with the most numerous including Meadow Brown, as seen from Table 1 and in Graphs 3, 6a and 6b.
- Species diversity peaks during weeks 14-23 (July and August) shown in Graph 4.
- The Section with the highest total counts was Section 1, with a total of 383 butterflies seen. The highest counts overall were at sections 1,2,3 and 8. This is illustrated in Graph 5a.
- The section showing the best species diversity over 2003 was Section 7, with a total of 17 species recorded there. This is illustrated in Graph 5b.
- With the average number of species per section was 11.5, there were 6 sections showing above-average results.
- While 5 sampling visits were not carried out, the results are still a good baseline of butterfly data. The line in Graph 1 clearly shows the major pattern in results for 2003, and all species recently known to occur at Sheepdrove Organic Farm were observed during the sampling.

The 22 Butterflies Recorded at Sheepdrove Organic Farm in 2003



Adonis Blue



Brimstone



Green-Veined White



Orange Tip



Large White



Small White



Common Blue



Small Copper



Speckled Wood



Large Skipper



Small Skipper



Holly Blue



Gatekeeper



Small Heath



Meadow Brown



Ringlet



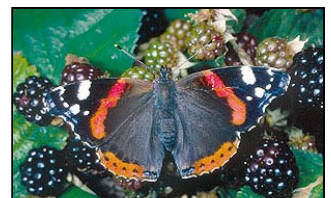
Comma



Small Tortoiseshell



Painted Lady



Red Admiral



Peacock



Marbled White

Images sourced at the website of Butterfly Conservation
www.butterfly-conservation.org
 Photos by Alan Barnes; except for Adonis Blue and Small White by Ken Willmott; and the Common Blue and Painted Lady by Martin Warren.

6. Discussion

6.1 The Results.

Because nectar-rich flowering plants were present along much of the transect, this is probably the reason why these results are a good representation of butterflies at Sheepdrove – all of the previously-recorded species were observed in this study.

The best butterfly numbers were observed at areas of abundant flowering. This makes sense because of the feeding needs of adults. Perhaps a major factor in the recorded data is food availability. At sections 9 and 10 there was quite different vegetation to the best sections, a lot of mown grass, and more clovers and dandelion, compared to sections 1, 2, 3 and 8, which had an abundance of knapweed and other flowers popular with butterflies, such as scabious.

However, perhaps there are other habitat factors important here, for example there were thistles at Section 10, (good nectar source) and both 9 and 10 were sections rather exposed to wind, and there was relatively lower habitat diversity.

It may be the case that the apparent peak in numbers seen in the results is not just about emergence of adult butterflies but also about the timing of flowers opening. However, we can see in Graphs 2a, 2b, 2c and 2d that there are different patterns of emergence for different species. Life cycles of butterflies are summarised in books such as Lewington 2003, which is held in Sheepdrove's reference collection. (Lewington, R. (2003): *Pocket Guide to the Butterflies of Great Britain and Ireland*: British Wildlife Publishing.)

There is probably correlation between the observed location of species and their specific host plants, for example with the Common Blues seen at Section 8, where host plants such as birdsfoot trefoil were present in suitable breeding habitat. More detailed vegetation data would be needed to explore the evidence on this.

Caterpillars will often be feeding on plant species that are very different to good nectar plants where adult butterflies are seen, and some butterflies are capable of long migrations. So the results do not necessarily reflect the location of the best breeding habitats for butterflies at Sheepdrove.

There were low numbers of butterflies recorded in the woodland at Section 6, at Nut Wood. While this may be seen as unproductive sampling time, there are good reasons to continue sampling in woodlands in future, most notably because there may be a distinct effect due to coppice management. Habitat near the Reedbed Water Treatment System may also change significantly in future, and in turn affect the species and numbers of butterflies there. Therefore the benchmark results are still of value.

Section 6 also showed a relatively low species diversity. In contrast, Section 7 had the highest species diversity, and this is presumably due to it having the greatest habitat variety. Along Section 7 there is a sunny glade within ancient woodland, open grazed field (which contained thistles), allotment gardens, domestic gardens, a young hedge, immature woodland, and a chalk grassland bank.

The lack of experience by the observer, combined with the difficulty in telling apart very active specimens at a distance - particularly brown butterflies - are factors bound to have skewed results in this study. The anomalous result for Small Heath (Week 14), alongside the results for Meadow Brown and Gatekeeper suggests human error.

Small Copper, although a common butterfly, has undergone decline nationwide. The caterpillar feeds primarily on common sorrel and sheep's sorrel, also rarely on docks. Since common sorrel grows readily on set-aside and non-improved grassland, it may be pressured by further expansion of improved grassland locally, or changes in sward structure on the byways, such as by increases in rank ruderals such as thistle and nettle.

The Adonis Blue record is important, as a UK BAP Species (Biodiversity Action Plan). While the records of Adonis Blue ought to be considered "unconfirmed" due to the inexperience of the observer – a Butterfly Conservation advisor did support the Biodiversity Officer's record of this species in 2002.

For both Adonis Blue and Common Blue, the conservation of diverse and open chalk grassland swards with trefoils, horseshoe vetch and related plants will be important in their survival at Sheepdrove.

Does Weather Affect Our Results?

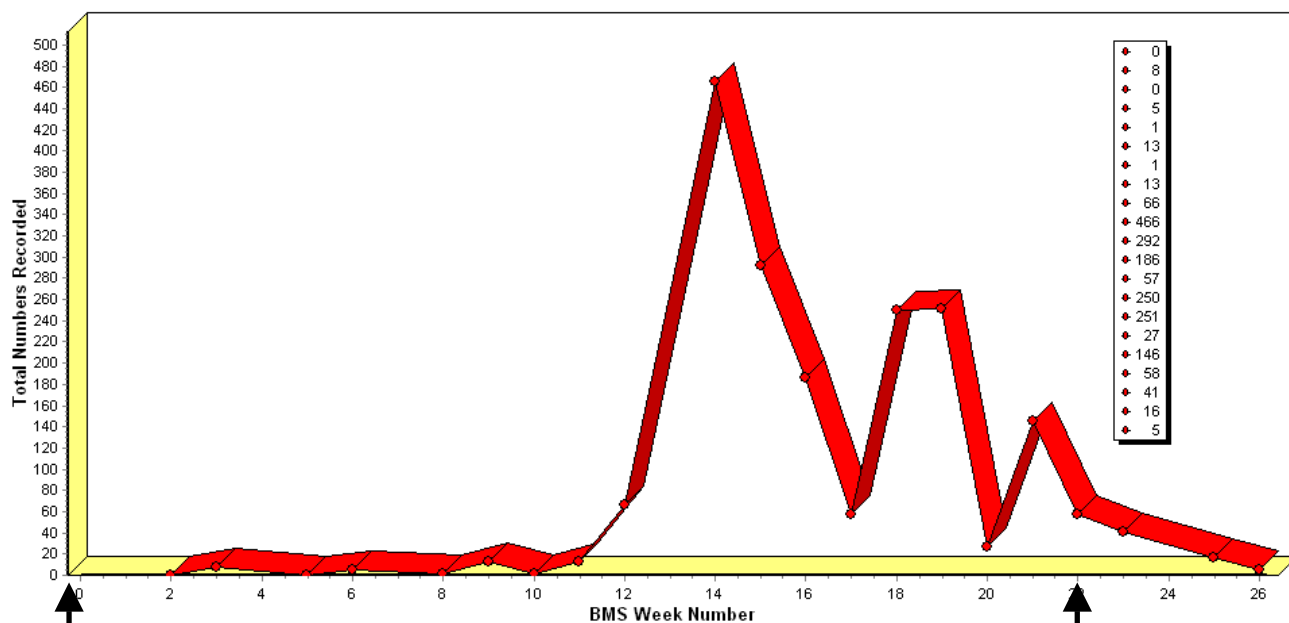
Method instructions by Butterfly Conservation recommend using the best days for sampling, ideally between 10.45hrs and 15.45hrs, during strong sunshine, good temperatures, and avoiding windy or wet days.

When we compare a graph of the butterfly counts with a graph of temperature recorded daily at 1pm at Sheepdrove’s weather station (Run by Centre for Ecology and Hydrology, Wallingford), there appears to be a good match between 2 major peaks of butterflies and 2 major heatwaves. (See below.)

The graphs also reflect dips in butterfly numbers recorded in late July (Weeks 16 and 17). There does not seem to be an obvious correlation early in the season, and this may be due to the fact that the butterfly season has not really begun.

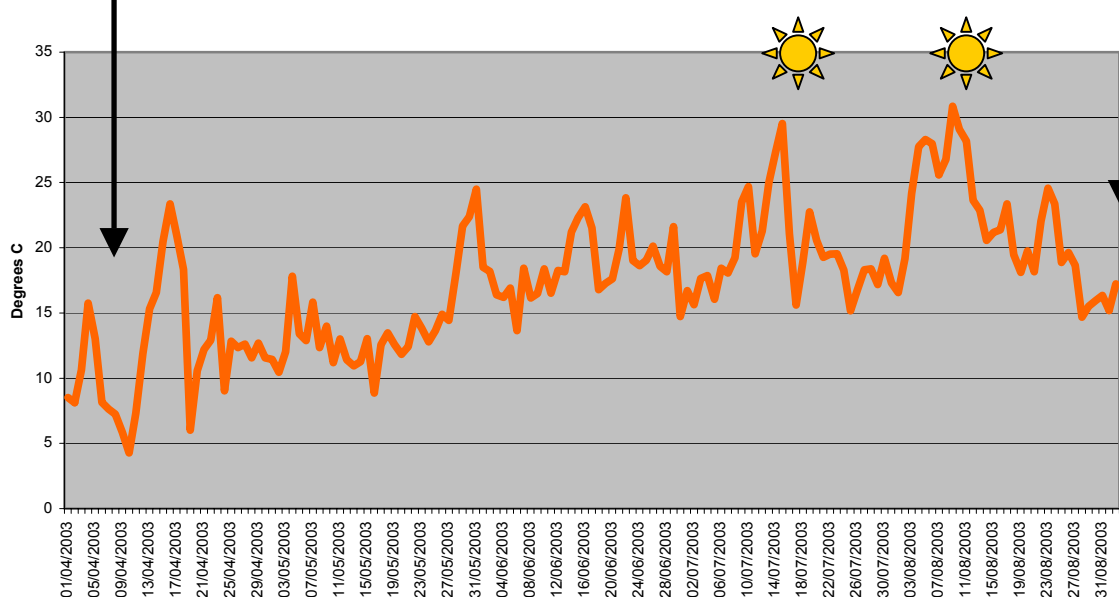
However, when 1pm temperatures *specifically* from the sampling dates are plotted with butterfly numbers the statistics do not show a correlation. (Graphs 8 and 9 produced in Excel.) Further investigation could be carried out on our 2003 results, or in a more detailed study in future.

BUTTERFLY SURVEY 2003 - Numbers of Butterflies Recorded



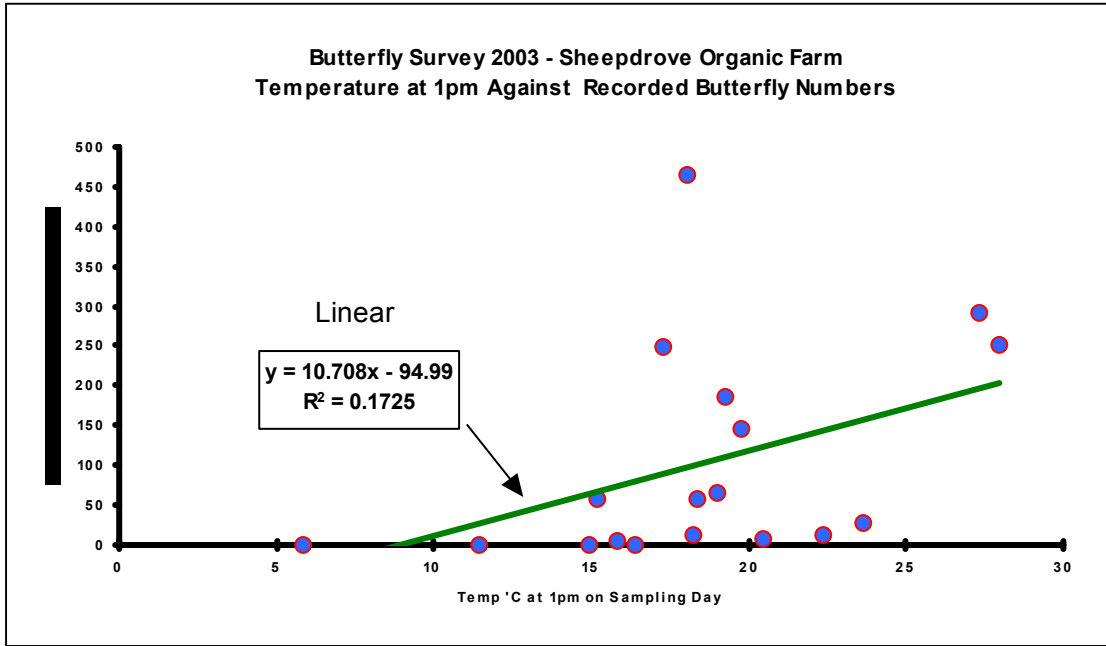
BUTTERFLY SURVEY 2003 - Sheepdrove Organic Farm

Temperatures at 1pm April 1st - Sept 2nd 2003

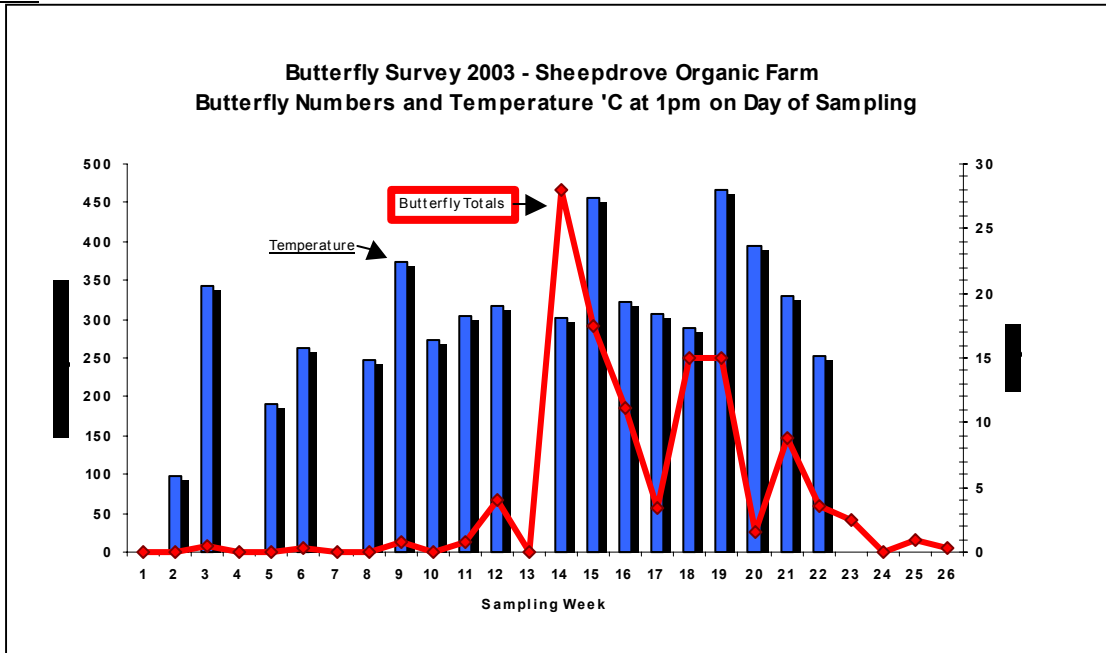


Arrows indicate matching dates

Graph 8



Graph 9



- The Graphs 8 and 9 above show the temperature specific to the sampling dates plotted with the numbers of butterflies counted.
- On Graph 8 the scatter graph shows no correlation - the value of R^2 on the linear regression is very low, (0.1725) and the points are very distant from the trend line.
- On Graph 9 once again the 1pm temperature does not appear to relate to the butterfly numbers observed.
- So there may be a relationship between the occurrence of summer heatwaves and observed butterfly numbers, but there is no such correlation with the temperature taken at 1pm on the day of sampling. Other factors, such as wind speed and the lifecycle timings for different species may be more important.

6.2. Evaluating the Methods, and Further Study.

Although a standard methodology was used, there are limitations within that method which should be considered, perhaps the main one being that this is only a transect sample. The strict guidelines of the method prevent Orange Tip from being included in the data tables, but it was seen very close to the transect line, and also seen elsewhere.

The location of the transect will be important because some butterflies are very habitat-selective but the only way of being more inclusive, is to undertake more transects in a variety of places. Observations did indicate that the presence of flowering plants along the sampling transect could greatly influence the species and numbers observed. This may or may not be a factor in the selection of future transect positions.

In future, sampling could be done at the same line of transect to maximise comparability, or along more transects, and additionally on key sites, or on new transect locations, if the aim is to maximise sightings of all species or perhaps compare habitats. Another point of interest is the timing of peaks in butterfly numbers, and this could be investigated by sampling more frequently than once per week during the peak period.

Further studies can be carried out to investigate issues such as the effect of habitat, field management, and organic farming. Weather data from Sheepdrove can be used to investigate the effect of different weather on the success of sampling, both during a season, and between years. However, the best butterfly data will be obtained if the best weather days are selected for sampling.

So the results can be used to inform further study, either repeating the same sampling, or with added features to enable the study of different environmental/habitat factors.

7. Conclusions and Recommendations

- Sheepdrove Organic Farm now has an easily-compared benchmark sample of butterfly species, which includes a good variety of common UK butterflies.
- A new species record for Small Copper was obtained. Sheepdrove's butterfly species list total is now 22.
- Habitat conservation for butterflies at Sheepdrove needs to consider both larval and adult foods, as well as the overall lifecycle needs of different species. Chalk grassland, garden areas and other areas of high plant diversity are key.
- Organic and wildlife-friendly management of farmland and gardens should be continued and increased where possible because it may lend crucial support to some species, e.g. keeping a high diversity of arable wild flora, not using herbicides on grass verges or byways, not spraying insecticides, etc. Although problematic plants need to be controlled, in places they can be tolerated. Nettles are larval food for Red Admiral, Peacock, Small Tortoiseshell and Comma, while Painted Lady often relies on thistles.
- Oilseed rape on chemically-farmed land nearby may contribute to the abundance of Small White and Large White.
- Apt management of the semi-natural alkaline grassland on the byways and the bank opposite the staff houses (Section 8) will greatly benefit the butterfly communities and is key to species such as Common Blue, Adonis Blue, and Small Copper.
- Conservation of species-rich swards containing high-nectar flowers and a variety of grasses (especially cocksfoot, Yorkshire fog, bents and fescues) is essential for species such as Small Skipper, Marbled White, Ringlet, Gatekeeper and Meadow Brown.

Butterfly Species at Sheepdrove Organic Farm

1. Large Skipper
2. Small Skipper
3. Brimstone
4. Large White
5. Small White
6. Green-Veined White
7. Orange Tip
8. Small Copper
9. Common Blue
10. Holly Blue
11. Adonis Blue
12. Red Admiral
13. Painted Lady
14. Small Tortoiseshell
15. Peacock
16. Comma
17. Speckled Wood
18. Marbled White
19. Gatekeeper
20. Meadow Brown
21. Small Heath
22. Ringlet

The new species recorded by the 2003 study: **Small Copper**

Extra species seen by Biodiversity Officer, Jason Ball, during 2001-02

Orange Tip
Adonis Blue
Painted Lady
Small Heath

Species List of Butterflies identified 1998 by Dr Chris Smith

Small Tortoiseshell
Peacock
Red Admiral
Brimstone
Large White
Small White
Green-Veined White
Meadow Brown
Gatekeeper
Ringlet
Marbled White
Speckled Wood
Large Skipper
Small Skipper (possible Essex Skipper?)
Common Blue
Holly Blue