Institute of Terrestrial Ecology

BUTTERFLY MONITORING SCHEME

Instructions for independent recorders

A Natural Environment
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The **Institute of Terrestrial Ecology** (ITE) was established in 1973, from the former Nature Conservancy's research stations and staff, joined later by the Institute of Tree Biology and the Culture Centre of Algae and Protozoa. ITE contributes to and draws upon the collective knowledge of the fourteen sister institutes which make up the *Natural Environment Research Council*, spanning all the environmental sciences. The Institute studies the factors determining the structure, composition and processes of land and freshwater systems, and of individual plant and animal species. It is developing a sounder scientific basis for predicting and modelling environmental trends arising from natural or man-made change. The results of this research are available to those responsible for the protection, management and wise use of our natural resources.

Nearly half of ITE's work is research commissioned by customers, such as the Nature Conservancy Council who require information for wildlife conservation, the Department of Energy, the Department of the Environment and the EEC. The remainder is fundamental research supported by NERC.

ITE's expertise is widely used by international organisations in overseas projects and programmes of research.

INTRODUCTION

The method described in this booklet has been devised to enable a person, with relatively little experience, to assess the changes in abundance of butterflies in their locality. The method was developed at Monks Wood Experimental Station and details of the methodology have been published (Pollard et al 1975, Pollard 1977). Transect counts are now used in the Butterfly Monitoring Scheme – a national scheme organised by the Institute of Terrestrial Ecology at Monks Wood Experimental Station and supported jointly by ITE and the Nature Conservancy Council.

This booklet sets out to explain simply how a count is made and how to use and interpret the results. It is important to follow the instructions exactly to ensure a standard method of recording which is, as far as possible, independent of observers. It is also important to stress that, unless the recorder can walk a transect every week from April to September, there is little point in starting. Also, in order to obtain really useful information from a transect, several years' data are needed to provide the comparisons between the numbers of butterflies from year to year.

Since the national scheme for monitoring butterflies was started in 1976, a considerable amount of interest has been generated in butterfly recording. As a result, by 1981, we now have 101 sites on our records, although recording has been discontinued at some of these sites. However, we do have 82 sites currently being monitored and we feel that in the interest of efficiency we can no longer accept new ones into the scheme.

Despite this, many people have asked for instructions, so that they can record a transect independently of the scheme. It has become obvious that there is a need for an instruction booklet on recording and on analysis of the data.

STARTING A TRANSECT

The transect is a fixed route along which walks are made. Once chosen, the route should not be altered. Annual comparisons are dependent on continuity from year to year and the annual index is dependent on weekly continuity.

The transect route should be chosen to be reasonably representative of the locality as a whole. However, it is interesting to include areas which are managed differently, or, perhaps, have more species present than others, or contain a population of a particularly interesting or local species. Sometimes, it is convenient to have a transect in an area which needs regular visiting for other purposes.

The transect should be only as long as is easily manageable, bearing in mind:–

1. It must be walked at least once a week.
2. At the height of the season, when there are many butterflies on the wing, counting will take longer than earlier in the year.
3. Someone else may take over the transect or substitute for a week or so in the absence of the regular recorder.

It is better to restrict the route to rides and paths, the boundaries of which are obvious. In more open habitats, established paths may be used and the butterflies counted within limits which are judged by eye. The precise width is not important, provided it remains unchanged but recording becomes more difficult if the width is over about 5 m. If no established paths exist, a fixed route can be marked out, using posts or canes, to ensure that the same path is followed.

Occasionally, the route chosen may make it necessary for some sections to be covered twice, but butterflies should only be recorded on the first occasion. If an unusual butterfly is seen the second time round, it may be tempting to record it, but this sort of observation should be noted at the bottom of the recording form.

Finally, when choosing the route, it is sensible to plan one which is roughly circular so that the end is close to the beginning.

Sections

Once the route has been chosen, it should be divided into sections. A maximum of 15 sections is used in the national scheme and is recom-

mended. Each section may be a discrete habitat type or subdivisions of the same habitat which are being managed differently. The index values for each species can then be subdivided according to section and the results used to investigate management or habitat differences. Once the sections have been defined, they should not be changed.

Map

Having decided on the transect route and divided it into sections, an accurate map should be made. On this map the length of each section should be recorded and also any landmarks at the beginning of each section, eg ditch, wall, tree-stump etc, and lateral limits of the transect. This level of detail ensures that another recorder can follow the route. The information on the map should be sufficiently detailed to permit the route to be re-located and used even after a lapse of some years. For this reason, the landmarks chosen should be reasonably permanent.

Habitat notes

A short description of the different habitat types in each section is useful for the transect records. It is also useful to have a short list of the plant species which are most abundant in each section. Particular attention should be given to butterfly foodplants, eg nettle or violets, and popular nectar sources such as thistles or teasels. The aim of these records is not to acquire quantitative information on the abundance of plants (which would be ideal, but is very time consuming) but to help, in a general way, with the interpretation of results.

Management

The effects of management are easily overlooked if not noted regularly. Even such routine management as path cutting may have an effect if, in the process, stands of nectar producing flowers are cut. For this reason, it is advisable to note, on the recording forms, the changes which take place as they happen. At the end of the season, these notes can be transferred to a permanent file or record card.

Photography

At Monks Wood, we have kept a photographic record of our transect route. Each section is photographed at its starting point, twice yearly on 1st April and 1st July. These photographs show more clearly than any written record the changes which have taken place.

Identification and general biology

It is essential to know as much as possible about the habits and distribution of the butterflies which occur on the transect route. For example, are they single or double brooded, common or rare? Do they overwinter as an egg, larva, pupa or adult butterfly? Are the butterflies recorded breeding in the area or are they breeding some distance away? A familiarity with this sort of information will enable fuller interpretation of the data. A good field-guide will provide some of the relevant information but, surprisingly, much is still not known of the ecology of our most common butterflies. The guide recently produced by Robert Goodden contains distribution maps and notes on the life cycle of each species of British butterfly. (*British Butterflies – A field Guide* by R. Goodden, David & Charles 1978) and ITE have an atlas of British butterfly distributions in preparation.

RECORDING

The recording form shown in Figure 1 lists the species, in alphabetical order, which occur most widely across the British Isles. The empty spaces are for additional species.

Before you start a transect, complete the top of the form up to the start time.

The transect should be walked at an even pace and only the butterflies which come within 5 m in front of the recorder should be counted. As you walk, note any butterflies seen by 'scoring' in the appropriate square. For some very abundant species, you may find it better to 'score' on a separate sheet of paper or notebook. Make sure that the correct total is clearly legible in the appropriate square as each section is completed. Do not record a butterfly which is flying further ahead, even if it is identifiable, as it may have moved away by the time you reach the spot. Similarly, with butterflies like the hairstreaks, which most frequently fly at tree-canopy level, it is not possible to count them without stopping to inspect the tree tops, so do not try and do so! It may help to imagine yourself walking along in a box, defined by your recording limits, counting only those butterflies which pass through the box as you walk along.

Carry a net, so that you can examine some butterflies more closely, to be sure of identification.

Fig. 1

Butterfly Census

Year	Date															Recorder			
	Site Name																		
Start Time	End Temp °C										% Sun					End Wind Speed			
Section	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total			
Brimstone																			
Common blue																			
Green-veined white																			
Hedge brown																			
Large skipper																			
Large white																			
Meadow brown																			
Orange tip																			
Peacock																			
Red admiral																			
Ringlet																			
Small copper																			
Small heath																			
Small skipper																			
Small tortoiseshell																			
Small white																			
Section	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15				
Sunshine																			

NOTES:

Please total each square

It may be necessary to stop or retrace your steps in order to capture an individual, in which case recording should resume where the initial stop was made. If you are in doubt about the identification of an individual, it should be entered on the form as the commoner of the likely species and doubts expressed in the notes.

If an individual butterfly is encountered more than once and you are certain that it is the same one seen previously, record it only once. However, if there is any doubt, enter it on the form on each occasion.

Ideally, the transect should be walked by the same person each time, but it is better to have a substitute than to miss a week.

When to record

The season starts on 1st April and finishes on 29th September. You may begin recording earlier and carry on later if you wish, provided there are butterflies to record. In the north, and on upland sites, there may be some difficulty starting at the beginning of April, but recording should commence on the first suitable day after 1st April.

'Recording weeks' start on 1st April. Week 1 runs from the 1st to 7th April, week 2, 8th to 14th April, and so on (Table 1) regardless of the day of the week on which 1st April falls. This ensures that week 1 in 1980 can be compared directly with the same week in any other year. At least one transect should be completed in each recording week. If for some reason you have to miss a week, this should be noted, with the reason (eg 'no suitable weather' or 'holiday').

You can record on any day of the recording week. It may be day 7 of week 1 and day 1 of week 2. Do not try and set aside special days for recording (eg weekends) but walk the transect at the first opportunity which presents itself each recording week. If the weather becomes very much better later in the week, there is no reason why another transect should not be walked providing you have the time.

Time of recording is restricted to a period around the middle of the day, from 10.45 to 15.45 (BST).

Weather conditions have a considerable effect on the numbers of butterflies seen. To ensure that the counts are standardised as much as possible:–

Table 1

Week No.	Days							Month
1	1	2	3	4	5	6	7	April
2	8	9	10	11	12	13	14	
3	15	16	17	18	19	20	21	
4	22	23	24	25	26	27	28	
(	29	30						
5 (								
(			1	2	3	4	5	May
6	6	7	8	9	10	11	12	
7	13	14	15	16	17	18	19	
8	20	21	22	23	24	25	26	
(	27	28	29	30	31			
9 (								
(						1	2	June
10	3	4	5	6	7	8	9	
11	10	11	12	13	14	15	16	
12	17	18	19	20	21	22	23	
13	24	25	26	27	28	29	30	
14	1	2	3	4	5	6	7	July
15	8	9	10	11	12	13	14	
16	15	16	17	18	19	20	21	
17	22	23	24	25	26	27	28	
(	29	30	31					
18 (								
(				1	2	3	4	August
19	5	6	7	8	9	10	11	
20	12	13	14	15	16	17	18	
21	19	20	21	22	23	24	25	
(	26	27	28	29	30	31		
22 (								
(							1	September
23	2	3	4	5	6	7	8	
24	9	10	11	12	13	14	15	
25	16	17	18	19	20	21	22	
26	23	24	25	26	27	28	29	

1. DO NOT walk a transect when the temperature is below 13°C (in northern upland areas this may be reduced to 11°C).
2. Between 13-17°C, a transect may be walked providing there is at least 60% sun.
3. Above 17°C, a transect may be walked in any conditions, providing it is not actually raining.

The shade temperature should be recorded in the space at the top of the form at the end of the walk.

Sunshine should be recorded section by section, as the transect progresses, in the boxes at the bottom of the form. Simply put, for example, 'S' if the sun is out for most of the time or 'C' for cloud. When the transect is complete, add up the number of sunny sections compared to the number of cloudy ones and express this as a percentage rounded up to the nearest 10%. If a shadow is cast, then conditions may be classed as sunny. If no shadows are cast, then record conditions as cloudy.

Windspeed should be estimated using the Beaufort scale, when the transect has been completed:–

0 smoke rises vertically

1 slight smoke drift

2 wind felt on face, leaves rustle

3 leaves and twigs in slight motion

4 dust raised, small branches move

5 small trees in leaf begin to sway

6 large branches move, telephone wires whistle

Wind observations should be made in an exposed area. It is inadvisable to record butterfly numbers when windspeeds are in excess of 5, but, as the effect of wind varies greatly in different habitatats, we have not set a rigid standard.

At the end of the transect, total the sections to complete the last column. Check that the records for temperature, sunshine, time of start, etc, are completed at the top of each form.

ANALYSIS OF DATA

Check field sheets for missing weeks and list these along with the form notes on a separate sheet or record card.

If you have done more than one walk per week, the total number of each species for each walk must be summed and the average taken, in order to obtain the weekly count figure. It does not matter if this is not a whole number.

For example, if on day 1 you record 4 green-veined whites and on day 5, 6 green-veined whites, the weekly count figure will be 5, ie $\frac{(6+4)}{2}$.

If you saw 3 meadow browns on day 1, and none on day 5 then the weekly count figure will be 1.5, ie $\frac{(3+0)}{2}$.

List your weekly count figures and your section counts on forms as shown in Figures 2 and 3.

If you have missed a week for any reason, then it is possible to estimate a figure for the missing weeks:—

Week No.	4	5	6	7	8	9	10	11	12
Nos Green-veined whites	2		8	12	6	2		0	

In this example, if you had missed weeks 5 and 10, take the average of the 2 weeks on either side the missing weeks so that the complete table will read:—

Week No.	4	5	6	7	8	9	10	11
Nos Green-veined whites	2	(5)	8	12	16	2	(1)	0

It is advisable to put your estimated counts in brackets, so that you will recognise them as estimated figures in the future.

If no count is made for more than one consecutive week, it is usually advisable not to calculate estimates or index values for that brood.

Fig. 2 INDEX

Year 1976 Site Woodwalton Farm

		April				M
SPECIES	INDEX	1	2	3	4	5
Small skipper	23					
Large skipper	16					
Brimstone	s10, a0			4	(2)	–
Large white	I 3, II 1					1
Small white	I 4, II + III 38					
Green-veined white	I 2, II 20					
Red admiral	31*					1
Small tortoiseshell	s7.5, II6, a2			1	(1.5)	2
Peacock	s8.5, a12			2	(2.5)	3
Meadow brown	150					
Small heath	93*					

Remarks

GURES BY WEEKS

	June					July					August				September					
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
								3	17	2	1									
						2	5	8	1											
	1				1															
				1	1				1											
		1	(1)	1	1			5	4	8	3	6	3	2	7					
								7	4	3		2	3			1				
						1	1	–	1	–	8	1	2	1	–	1	2	(4)	6	3
		2	(1)			1		5							2					
								7	3	1										1
						8	27	38	17	26	14	17	1	2						
			(3.5)	7	5	5	6	1	–	–	7	12	19	19	5	2	1	(0.5)		

Note: week 1 always begins on April 1st
I, II, III= generations
s – Spring a – Autumn = seasonal flights
( ) = estimated
* = generations not distinct

However, if the missing weeks are known to be due to consistently bad weather and are not the peak weeks for the species, it may be possible to treat 2 weeks as a single missing week. This decision can only be a matter of judgement.

It is now possible to calculate the annual index for each species. The annual index of each species is the sum of the weekly counts (including the estimated figures for missing weeks).

The Section Index is the sum of the mean weekly counts for each section. The section index is calculated by adding the figures for each species section by section. The final figure is then transferred to the "index by section form" (Figure 3). If you have done more than one count in a week, the average count of that week is used.

The sum of the section indices will not necessarily equal the annual index for that species, as the estimates used in calculating the annual index will not be part of the section calculations.

It is now possible to examine the distribution of the butterflies within the transect and to try to relate these to the available nectar sources, foodplants, shelter, shade, wetness, etc.

At the end of 2 or more seasons, it becomes possible to look at changes in butterfly numbers from year to year, and to relate these changes to management and weather. Changes in the distribution of butterflies within the transect may also occur. Sometimes, the reasons for these changes may be very obvious, sometimes not. The opening of a narrow, shady woodland ride will probably increase the numbers of butterflies in that section. The clearance of an abundant nectar source will often decrease the numbers of butterflies seen.

The weekly counts for a season provide a record of the phenology, that is the timing of the flight period, of the butterflies, in the area. The changes in flight period from year to year can readily be shown and are of great interest, as this type of data has not previously been available.

It is important to stress that the annual index is in no way a population estimate and gives little indication of the actual number of butterflies present. The annual index can only be used to indicate the relative abundance of butterflies on a particular site from year to year. After several years, a comparison of site trends with regional and national

Fig. 3 **INDEX FIGURES BY SECTION**

Year 1976 Site Woodwalton Farm

Species	Gen	1	2	3	4	5	6	7	8	9	10	11	12
Small skipper		15	4				3				1		
Large skipper		4	5	1		1	3	1			1		
Brimstone	s	2	2	1	3								
	a												
Large white	I			2	1								
	II			1									
Small white	I	1		1	1								
	II + III	11	5	4	4	1	4	1		4	4		
Green-veined white	I			1	1								
	II	4	1	5	2	1	1	2	1	1	2		
Red admiral	*				18		1	6	1		1		
Small tortoiseshell	s				2	2							
	II	1			1			1	1	2			
	a				2								
Peacock	s	1			5								
	a				11			1					
Meadow brown		76	28	7	7	7	10	3	6	5	1		
Small heath	*	63	22				1	1		2			

Remarks

Note: Section index and transect index may not tally if estimates used.

* — generations not distinct

data will be generally available for the use of all recorders who wish to compare their results with those from elsewhere.

If you have difficulties at any stage of the procedure we will certainly be pleased to help and advise. Please do not hesitate to contact the Butterfly Monitoring Scheme at Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambs PE17 2LS, or telephone Abbots Ripton 381. We would also be glad to hear of any points of interest which your recording reveals.

References

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