Manual for
Butterfly Monitoring

Butterfly
CONSERVATION EUROPE

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De Vlinderstichting

Butterfly Conservation Europe

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The Orange-tip (Anthocharis cardamines) is a widespread butterfly in most of Europe.

Contents

Summary

Monitoring butterfly populations is an important means of measuring change in the environment as well as the state of habitats for biodiversity. It is also a useful way that both professional ecologists and volunteers can contribute to the conservation of butterflies and biodiversity. This manual describes how to set up butterfly monitoring, do the counts and report on them.

1) Butterflies can be monitored by anyone who has the time (one hour a week is enough) and is familiar with the butterfly species at the place where the counts have to be made.

2) Butterflies are counted along fixed routes, known as transects, which are divided into smaller sections. It is important that transects are not too long and close to your home, to make them easy to repeat. The details of the route should be written down so that it can be followed by other recorders in the future.

3) Butterflies should be counted throughout the butterfly season under good weather conditions that meet minimum criteria. Counts should ideally be made once every week, or at least once every two or three weeks.

4) The transect is walked at a slow, constant pace and all butterflies are counted in an imaginary box 2.5m to each side and 5m in front and above you.

5) Be safe! Explore the area before you set up your transect, to identify any hazards and make sure you have the landowners' permission. Let someone know where you are going, what time you expect to be back, and what they should do if you are late. Carry a mobile phone, take water and protective clothing in case the weather changes. Beware of ticks.

6) There are a few species for which egg or larval counts within defined plots are more effective than the count of adults on transects. For such species a plot consists of a patch of habitat which can be counted within 30-60 minutes. You can have more than one plot to cover large sites or breeding areas. Ensure that plots are shown on a map and described in detail so that they can be repeated.

7) If your country has a national monitoring scheme, contact the co-ordinator before you establish a transect and make sure you submit data in their required format. If your country does not have a formal scheme, we advise you to enter your records in the online Butterfly Monitoring Recording webpage that can be reached from the end of 2012 via www.bc-europe.eu. Your data can still be used to develop European wide indicators and be available for any future national schemes.

8) It is possible to analyse your own data even if you are not part of a scheme. Suitable methods can be sourced from the references section of this report.

Introduction

Butterfly monitoring makes it possible to assess the trends of butterfly populations. This allows us to track population changes on a local scale as well as across a region, a country and even at the European scale. These trends can be used as indicators of biodiversity and environmental change. The monitoring is based on a standard method that can be used in the field. This guide explains how you can participate.

Insects are by far the most species-rich group of animals, representing over 50% of terrestrial biodiversity. Contrary to most other groups of insects, butterflies are well-documented, easy to recognize and popular. Butterflies use the landscape at a fine scale and react quickly to changes in land use, and to processes such as farmland intensification or abandonment. A sustainable butterfly population relies on a network of breeding habitats scattered over the landscape. This makes butterflies especially vulnerable to habitat fragmentation. Moreover, many butterflies are highly sensitive to climate change and have been used in models predicting the impact of climate change on wildlife. All this make butterflies one of the best species group for monitoring changes in biodiversity.

Butterflies have been counted by Butterfly Monitoring Schemes since 1976. There are well organised schemes active in Europe in many countries, from Finland in the north to Spain in the south. Even where there is no formal scheme for a region or country, single transects or small groups of transects are still very valuable , both as local descriptors of changes in butterfly diversity as well as contributing to a European wide programme where butterflies are used as indicators. These indicators respond quickly to changes in the environment and are useful to follow the changes in Europe's biodiversity.

Butterflies can be monitored by anyone who has the time and is familiar with the butterfly species at the place where the counts have to be made. You can do the counts as part of a team: it is more fun to share experiences of what you saw and you can replace each other during holidays.

This manual describes how to set up a butterfly transect, when and what to count and how to process the data. This will help butterfly conservation, but above all it is great fun and a great way of learning about local butterflies.

The transect

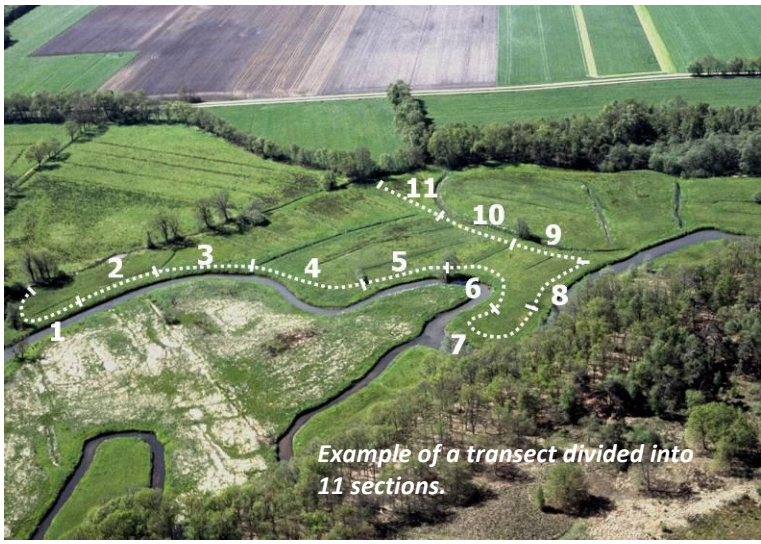
Changes in butterfly numbers are sampled mainly through regular counts on fixed routes, known as transects. These line transect counts have proven to be an easy and effective way to monitor diversity and abundance of butterflies. In some cases point-transects can be used where habitats are difficult to walk over (such as wetlands). In this chapter we describe how to select and describe such a transect.

Multi-species transects

In brief, a fixed route (transect) is established at a site and butterflies are recorded along the route on a regular basis under reasonable weather conditions for a number of years. Although chosen at random or via a grid in some monitoring schemes, most transects are chosen by the person who wants to do the counts.

Some general rules on how to select a transect:

- Transect routes are chosen to monitor a particular habitat type and land use (or management activity) on a site. This means it is best to ***restrict the transect to one habitat and land-use type***. If you want to compare several habitats or management activities, it is better to create several short transects instead of one long one.
- However, it is also practical to ***divide a transect into smaller sections***. This makes it easier to keep an overview, process the data and offers extra possibilities to analyse the results. In some of the larger schemes (e.g. Germany and Netherlands) the sections within transects all have a fixed length of 50m, but in others it is free (e.g. the United Kingdom and Irish schemes). Whatever you choose, take care you know the exact length of each transect. This can be done by entering the transect on Google Maps and measure the length of each section.
- ***Don't make the transect too long***. A transect of 1 km takes about 45-60 minutes to count in summer. For this reason the length of the total transect in some countries is restricted to 1000m (20 sections of 50m). If the site is big and you want to sample more habitat types, it is better to split it up into several shorter transects.



Example of a transect divided into 11 sections.

- It is more practical if ***the transect is close to your work or to your home***. The more often a transect is counted, the better the resulting data. A transect at greater distance can be hard to combine with work, family and social obligations. If a transect can be counted during a lunch break or while walking the dog, the chance that it gets counted for many years rises considerably.
- Ensure that ***the transect and different sections can be recognised by someone else***. This is also convenient for yourself, as you don't have to pay close attention all the time to check which section you are in. Try to stick to existing paths and use landmarks as poles, prominent trees or fences as starting points for new sections. If possible mark the start and stop of each section on a detailed map and by GPS (also often available on modern smartphones).
- ***Enter the transect on a google map*** by creating your own map and adding separate lines for each section. This also offers the possibility to measure the exact length of each section and the complete transect. The map can then be shared, e.g. with a co-ordinator.

Lycaena hippothoe

Single species transects

Some rare species occur on remote sites which are far away and hard to reach. However, these species can have a high conservation value and it can be difficult to count transects throughout the whole butterfly season. In such cases it can be better to create a single-species transect, which is only counted in the flight period of the rare butterfly concerned. Three visits during the flight period can be sufficient. As only one species is recorded at such sites, the transect can also be counted by relatively inexperienced butterfly-recorders . As long as the target-species can be distinguished from all other species, such a transect can be considered. The other rules for a line transect should be applied.

The counts

The main aim of butterfly monitoring is to collect data to compare changes in the population size (abundance) from year to year. For this reason transect counts can only be made under set weather conditions and times of the day. For plots the conditions are different from line transects.

Line transects

- Try to count for the whole butterfly season. The best start- and stop-date depends on where you live in Europe. This means that the low lying transects in Southern Europe start in March or even February, whereas transects in the Nordic countries or in high mountains don't start before May or even June.
- Try to count as often as possible, ideally once every week. If there are several gaps of three or more weeks, it may be difficult to generate an accurate measure of butterfly abundance from the data. If once every week is not possible, set yourself a more realistic target of once every two weeks.
- Single species transects only have to be counted during the flight period of the target species, and for some species as few as three weeks may be all that is needed. It is important to cover the main flight period so local experience or help can be very useful.

Conditions

To make counts of adult butterflies it is necessary that the weather conditions are suitable for butterfly activity:

- Butterflies are most active between 3.5 hours before and 3.5 hours after the sun is at its highest point. The best moment for counts depends on where you are in your time zone. In the United Kingdom counts are best made between 9.30h and 16.30h summertime, in the Netherlands between 10.00h and 17.00h, further east in the Central European Time-zone between 9.30h and 16.30h will be best and in East Poland between 9.00h and 16.00h. Under exceptionally hot situations these times can be extended with an extra hour on both sides.
- Only count when the air temperature is 13°C or more.
- Between 13 and 17°C it is important that it is sunny with a cloud cover of 50% or less.
- When the temperature is 18°C or more it is also permissible to count with a higher cloud cover.
- The wind should be 5 or lower on the Beaufort scale (called a fresh breeze), which is when the branches of a moderate size move and small trees in leaf begin to sway.

To summarise: only count in nice and pleasant weather!

How to count

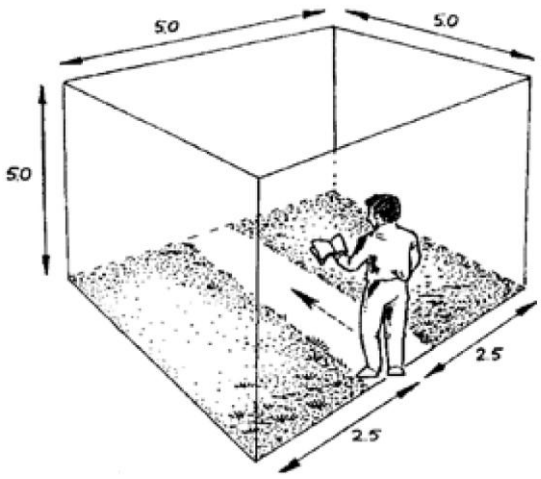
- Walk your transect at a slow, constant pace.
- Count all butterflies by individual species in an imaginary box, 2.5m to each side and 5m in front and above you (see right).
- You may stop (e.g. to identify a butterfly), but do not count when you are stationary, or when looking behind.
- Write down the number of butterflies per species on a small notebook or use a voice recorder (also an app on many smartphones).

What to count

- Count all butterflies, except on a single-species transect (where you count one species only) or on an egg or larval plot.
- Write them down per section.

Be safe!

- Explore the area before you set up your transect, to identify any hazards.
- Make sure you have the landowners' permission.
- Let someone know where you are going, what time you expect to be back, and what they should do if you are late.
- Carry a mobile phone.
- Take water and protective clothing in case the weather changes.
- Beware of ticks as they may cause diseases.



Submitting your counts

It's important that counts are made available for trend-calculation and analysis. Combining data from different transects makes it possible to improve the quality of the trend data at country and European levels.

Butterfly Monitoring Scheme

If you are in a country or region where there is a Butterfly Monitoring Scheme please contact the co-ordinator for the best way to submit your data. For a list of these schemes and their co-ordinators please visit the website www.bc-europe.eu, *go to Gateway to projects and then to butterfly Monitoring*. In some countries this is done online, in other countries there is a computer program or you have to enter your data on an Excel sheet or on paper.

Other countries

If you do your transects on a place where there is no Butterfly Monitoring Scheme yet, we advise you to enter your records in the online Butterfly Monitoring Recording webpage that can be reached from the end of 2012 via www.bc-europe.eu. Your counts will be used for European wide indicators, like the European Grassland Butterfly Indicator and the European Butterfly Climate Change Indicator, operated by the European Environment Agency. Furthermore as soon as a butterfly monitoring scheme starts up in your country or region, your data will be made available.

Analysing your own data

It is possible to analyse your data even if you are not part of a scheme.

Other possibilities

In some cases the habitat or species doesn't allow for transect counts of all species. The habitat may be too inaccessible (e.g. wetlands or steep mountains) or the behaviour of the butterflies makes it hard to do reliable counts. In these circumstances, we need different and more specialised methods, especially those which take less time ('reduced effort' methods). Furthermore, for some high profile rare species we may want an estimate of the total numbers present. Again, more specialised methods are needed.

We will only briefly touch upon a few of the possibilities:

- Point counts
  In some exceptional cases it is difficult or even impossible to count on line transects, for example on some wetlands. In such cases point counts can be used: accessible point are marked where a count (often for 5 minutes) is performed.
- Timed counts
  Timed counts are a useful method for rapid monitoring of rare species, especially those whose populations tend to 'move around' large sites. The method is used in the United Kingdom for monitoring rare species that live in extensive upland or woodland habitats such as *Mellicta athalia* and *Argynnis adippe*. The flight area is defined, then walked systematically and the number seen per minute of search effort recorded. The method requires considerable experience in assessing butterfly flight areas and access to transect data to generate a meaningful abundance measure from the raw count data.
- Egg plots
  There are a few species for which egg counts within defined plots are more effective than the count of adults on transects. Typical examples are *Phengaris (Maculinea) alcon* and *Thecla betulae*. The latter can actually best be counted in winter. For such species a plot consists of a patch of habitat which can be counted within 30-60 minutes. You can have more than one plot to cover large sites or breeding areas. It is essential that the area is indicated and measured properly and entered onto a Google map.

***Thecla betulae* is a species for which egg-counts in winter are more effective than butterfly-counts in summer.**

- Larval plots
  In some special cases larval counts can be easier and more reliable than counting adults or eggs. Like with egg plots it involves systematic searches of the occupied parts of sites for larvae or larval webs, and counting the number seen along structured walks in a fixed recording box. The counts are expressed as a number per unit of search time or transect length. This method is used for *Lycaena dispar* larvae along ditches in the Netherlands, as well as for the counts of larval webs of *Euphydryas aurinia* and *Melitaea cinxia* in the United Kingdom. *Lycaena dispar* counts can be made in August (young larvae) and repeated in May (large larvae, this also gives information on winter survival), *Euphydryas aurinia* web counts are made in the autumn, after the breeding season, whilst *Melitaea cinxia* nest counts are made in the spring prior to adult emergence.

- Canopy species
  Canopy dwelling species, like *Apatura iris* and some of the hairstreaks, are not effectively monitored on transects or plots. This is because encounter rates are low due to the small proportion of time individuals spend at lower levels and much of the habitat (closed canopy forest cover beyond the forest edge) is inaccessible. Although there are some attempts to develop methods for these species, only the egg plots for *Thecla betulae* are an easy alternative at the moment.
- Mark-release-recapture
  The mark-release-recapture (MRR) method is a tried and tested technique to estimate absolute abundance of butterfly populations. The method is highly labour intensive and requires capturing, handling and marking individual butterflies. For these reasons, MRR is not a practical option for wide scale annual monitoring of butterfly populations.
- Distance sampling
  Distance sampling methods are a group of techniques used to estimate the absolute population size or density of wildlife populations that live in open habitats. Distance sampling works on the assumption that the further away you look and record, the fewer individuals will be seen, and that this relationship can be described mathematically through a detection function. The method is a less labour intensive alternative to MRR, but is technically demanding and the analysis of the data is complicated. For these reasons, it is chiefly used to assess the population size of rare species in special cases.

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National Butterfly Monitoring Schemes:

Belgium: www.inbo.be/content/page.asp?pid=MON_VL_start
Finland: www.environment.fi/butterflymonitoring
France: vigienature.mnhn.fr/page/suivi-temporel-des-rhopaloceres-de-france
Germany: www.tagfalter-monitoring.de
Ireland: butterflies.biodiversityireland.ie
Netherlands: www.vlinderstichting.nl/vlinders.php?id=91
Sweden: www.lu.se/dagfjarilar
Switzerland: www.biodiversitymonitoring.ch/en/home.html
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