



# REGIONAL ACTION PLAN FOR THE BUTTERFLIES AND MOTHS OF EASTERN SCOTLAND

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This Regional Action Plan is one of a series being drawn up by Butterfly Conservation's branches throughout the UK. These plans were initiated under Butterfly Conservation's "Action for Butterflies" project, supported by the World Wide Fund for Nature, Scottish Natural Heritage, English Nature, and the Countryside Council for Wales. The preparation of this Plan was part-funded by SNH.

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## Executive Summary

This Regional Action Plan summarises existing knowledge of the distribution, status and ecology of high and medium priority butterflies and moths in Eastern Scotland, and outlines actions and targets for their conservation.

The prime purpose of this Plan is to guide the activities of Butterfly Conservation's regional Branch for the East of Scotland. However, we hope that it will also be of use to others, particularly those preparing Local Biodiversity Action Plans (LBAPs), and to those involved in land management.

The high priority butterflies and macro-moths<sup>1</sup> for Eastern Scotland are:

<b>BUTTERFLIES</b>	
Large Heath	<i>Coenonympha tullia</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Northern Brown Argus	<i>Aricia artaxerxes</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>
Small Blue	<i>Cupido minimus</i>
<b>MOTHS</b>	
Argent and Sable	<i>Rheumaptera hastata</i>
Barred Tooth-striped	<i>Trichopteryx polycommata</i>
Cousin German	<i>Paradiarsia sobrina</i>
Dark Bordered Beauty	<i>Epione vesperterea (=parallelaria)</i>
Lunar Yellow Underwing	<i>Noctua orbona</i>
Narrow-bordered Bee Hawk-moth	<i>Hemaris tityus</i>
Netted Mountain moth	<i>Macaria (=Semiothisa) carbonaria</i>
Northern Dart	<i>Xestia alpicola</i>
Square-spotted Clay	<i>Xestia rhomboidea</i>
Sword Grass	<i>Xylena exsoleta</i>

<sup>1</sup> "Micro-moths" have been omitted (see Section 3.3).

The main priorities identified are:

### **Research, Survey & Monitoring**

- To identify all core colonies of priority species.
- To undertake research where necessary to determine habitat requirements.
- To ensure monitoring continues on established sites, and set up additional monitoring where necessary.
- To collate monitoring data and provide feedback to recorders, in co-operation with UK schemes and Local Biological Record Centres.

### **Site safeguard & Management**

- To encourage or undertake site management where necessary.

### **Advisory**

- To liaise with landowners and statutory and voluntary organisations to promote the effective conservation of Lepidoptera in the Region.
- To disseminate information on the distribution and habitat requirements of key species to those who can further their conservation.

### **Publicity**

- To promote the need for conserving Lepidoptera as part of the wider biodiversity message.
- To publicise the activities of Butterfly Conservation, and to recruit additional members to Butterfly Conservation's East of Scotland Branch.

## 1 Introduction

This Regional Action Plan is one of a series being drawn up by Butterfly Conservation's branches throughout the UK. These plans were initiated under Butterfly Conservation's "Action for Butterflies" project, supported by SNH, World Wide Fund for Nature, English Nature, and the Countryside Council for Wales, and follow a standard format (Bourn *et al.* 1996).

### Functions of the Regional Action Plan

The Plan has several intended functions:

- It summarises current knowledge on the distribution, conservation status and ecology of key butterfly and moth species within the Region, and points the way to action for their conservation.
- It provides guidance for Butterfly Conservation's own regional Branch in planning its activities and setting priorities for the future.
- The Plan also aims to inform other organisations about issues of butterfly and moth conservation in the area, and how these can be addressed practically in a co-operative framework. Targets have been set with a particular regard to partnership approaches in the work.

### Coverage

The Region dealt with in the plan (Map 1) is the area covered by Butterfly Conservation's 'East of Scotland' Branch. This corresponds with the combined local authority areas of Aberdeenshire, Aberdeen City, Angus, Clackmannanshire, Dundee City, East Lothian, City of Edinburgh, Falkirk, Fife, Midlothian, Perth and Kinross, Scottish Borders and West Lothian.\*

### Features of Eastern Scotland

The Region covers about 2.8 million hectares and accommodates a population of approximately 2.3 million (ca. 44% of the total population of Scotland). Most of the population is in the eastern lowlands, with over a third concentrated in the conurbations of Edinburgh, Aberdeen and Dundee. Large tracts of uplands in the Borders, Perthshire and Aberdeenshire are only sparsely-populated.

\*The area of East of Scotland Region comprises the following Watsonian vice counties: 78 Peebleshire, 79 Selkirkshire, 80 Roxburghshire, 81 Berwickshire, 82 East Lothian, 83 Midlothian, 84 West Lothian, 85 Fife & Kinross, 87 West Perthshire (in part), 88

Mid Perthshire, 89 East Perthshire, 90 Angus, 91 Kincardineshire, 92 South Aberdeenshire, 93 North Aberdeenshire and 94 Banffshire (in part).

**Map 1. The East of Scotland Region**, showing sub-divisions used for the purposes of this plan.

*North:* 1 Aberdeenshire; 2 City of Aberdeen.

*Central:* 3 Angus; 4 Perthshire & Kinross; 5 City of Dundee; 6 Fife; 7 Clackmannan.

*South:* 8 Falkirk; 9 the Lothians and Edinburgh; 10 Borders.

Much of the region has been extensively modified by human activity. In the lowlands the greater proportion of each county is taken up with agriculture. Native woodland forms less 1% of the land surface, and coastal vegetation tends to be reduced to a very narrow strip by agriculture or entirely eliminated by industrial development and housing. Consequently areas of wildlife interest tend to be fragmented. Since the war there have been considerable losses of native woodland, hedgerows and rough grassland, and corresponding increases in arable, urban development and conifer plantations.

Over the past 150 years large parts of the uplands (primarily the moorlands and woodlands) have been managed for game. These remain an important habitat for Lepidoptera, though large areas have been extensively altered by commercial plantations this century. Changes in grazing practice have also led to losses of heather and mire and increases in bracken and improved grassland (Mackey *et al.*, 1999).

### **Butterfly Conservation in Eastern Scotland**

Considering the population size, current membership of Butterfly Conservation in the Region is low and geographically scattered. The Branch looks forward to a period of expanding activity increasing its membership and raising the profile of Lepidoptera conservation in the Region. However, the number of active members in relation to the size of the potential conservation challenge is extremely small. For this reason the targets outlined in this Action Plan are modest, in relation to those attempted by larger Branches in other parts of the UK.

Delivery of Butterfly Conservation's objectives can only be achieved through co-operation and partnership with:

- private landowners and their respective organisations, such as the National Farmer's Union of Scotland, Scottish Landowners' Federation, the Crofter's Union and the Timber Grower's Association;
- organisations with land management responsibilities, such as Forest Enterprise (FE), Scottish Executive Rural Affairs Department (SERAD), the Royal Society for the Protection of Birds (RSPB), Scottish Wildlife Trust (SWT), National Trust for Scotland (NTS), and the Woodland Trust (WdT);
- those with a remit for providing advice on nature conservation and land management, such as SNH, FC, SAC and FWAG;
- and those who can help with research objectives such as CEH, Universities and FC (research).

The Region attracts naturalists from all over Britain, and their continued help will be also needed to ensure adequate field survey in the foreseeable future.

## 2 Sources of Information

The information used in the compilation of this Plan has come from Butterfly Conservation's East of Scotland Branch, Local Record Centres, the *Scottish Diurnal Lepidoptera Project (SDLP)*<sup>1</sup>, a recent review of the occurrence of UK Biodiversity Action Plan (BAP) invertebrates in Scotland (Sivell & Phillips, 1999), and also from UK-wide recording schemes.

Reference has also been fully made to the Action Plans published for priority species as part of the UK BAP (Department of Environment, Transport and the Regions - DETR, 1995, 1999a & 1999b) and those prepared by Butterfly Conservation as part of its *Action for Butterflies* project from 1995-2000 (see Appendix VI).

For butterflies, *The Atlas of Butterflies in Britain and Ireland* (Heath, Pollard, & Thomas, 1984) has been used as a baseline against which trends have been examined. 'Recent' butterfly data are based on the latest maps from the '*Butterflies for the New Millennium*' project, organised by Butterfly Conservation and the Centre for Ecology and Hydrology (CEH, formerly the Institute of Terrestrial Ecology, ITE), which comprise records for the period 1995-99 (Fox & Asher, 2000).

Additional data for Fife have been made available from Fife Council's biological database *Fife Nature*, which has produced a provisional butterfly atlas (Smout and Kinnear, 1993). Some data have also been obtained from the following sources: Perth Museum, the Barrack Street Museum in Dundee, the Lothians Wildlife Information Centre, and Hawick Museum.

For information on the Butterfly Monitoring Scheme (BMS), organised by the Centre for Ecology & Hydrology (CEH), reference has been made to the annual reports, and information on independently-monitored transects in Scotland 1999 (Greatorex-Davies, pers. comm.).

For moths, the position is currently less satisfactory. Almost all species treated in this Plan have had records submitted to the UK Scarce Moth Network co-ordinated by Butterfly Conservation and supported by the JNCC. The data are not yet available in published form. The distribution data (Section 5) has therefore been drawn largely from the interim maps (Waring, 1992), but for priority species this has been updated with reference to the species action plans compiled by the government (DETR, 1995, 1999a & 1999b). "Recent" records refer to those made since 1979.

Historically, moths are divided into "macro-moths" (large moths), or "micro-moths" (small moths). Although the status of the "micro-moths" in Scotland has been summarised by Bland and Young (1996), our current knowledge on ecology, distribution, threats and habitat management is generally poor (see Section 3.3).

<sup>1</sup> *The SDLP was a two year ITE-led, SNH-funded project (Pearce et al., 1999), which collated distribution data for 15 scarce species of butterflies and day-flying moths, and established baselines for monitoring their populations and habitats at selected sites.*

### 3 Assigning Regional Priorities

#### 3.1 Butterflies

Regional priorities are determined using criteria proposed in Butterfly Conservation's Guidelines for producing Regional Action Plans (Bourn *et al.*, 1996). These criteria are used to amend the UK rating given in the UK BAP (Kinnear, P., 2000; Appendix I).

The criteria are *rarity*, *rate of decline*, and *proportion of the UK resource held within the Region*, and are used to assign species to **High**, **Medium** or **Low** categories. Low priority species have not been included in this Plan. (For a fuller discussion on how regional priorities were derived, see Appendix IV).

#### UK BAP Rating

Two species recorded in the Region are termed “UK Priority Species”:

Northern Brown Argus	<i>Aricia artaxerxes</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>

These species are assigned to the **High Priority** category in the Plan.

A further four “UK Species of Conservation Concern” are present:

Large Heath	<i>Coenonympha tullia</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Small Blue	<i>Cupido minimus</i>
Small Pearl-bordered Fritillary	<i>Boloria selene</i>

These species are *initially* assigned to the **Medium Priority** category in the Plan.

#### Regional Priority

A species qualifies for a higher regional priority than its UK rating if it fulfils one or more of the following criteria:

##### *Rate of Decline*

Species showing a decline of >32% over 25 years in the number of 10 km squares occupied within the Region.

The following species have had their rating enhanced due to their recent rate of decline:

Small Pearl-bordered Fritillary	<i>Boloria selene</i>
Large Heath	<i>Coenonympha tullia</i>
Scotch Argus	<i>Erebia aethiops</i>

### Rarity

Species which occur in less than 0.6% of tetrads (a tetrad is a 2 x 2 km square) in the Region, or less than 30 colonies.

The following species has had its rating enhanced due to its rarity:

Small Blue

*Cupido minimus*

### Proportion of the UK Resource

Species for which the Region holds 20% or more of the total UK population.

The following species has had its rating enhanced due to the proportion of the UK resource within the Region:

Mountain Ringlet

*Erebia ephron*

### Summary

Thus the following species have had their priority rating enhanced for Eastern Scotland:

Species	UK Rating	Regional Rating
Small Blue	Medium	<b>High</b>
Small Pearl-bordered Fritillary	Medium	<b>High</b>
Large Heath	Medium	<b>High</b>
Mountain Ringlet	Medium	<b>High</b>
Scotch Argus	Low	<b>Medium</b>

### Under-recorded Species

Several species qualified on apparent rate of decline, but there is a consensus among recorders that these apparent declines are probably due more to under-recording than due to habitat loss. However, efforts should be made to improve the recording of these species, so that any real changes in distribution become clearer. These species are:

Green Hairstreak

*Callophrys rubi*

Purple Hairstreak

*Neozephyrus (= Quercusia) quercus*

Dark Green Fritillary

*Argynnis aglaja*

The Green Hairstreak is problematical in that it is certainly under-recorded in some areas, but in others, for example the Lothians and Borders, it may well have declined, primarily due to heavy grazing of its moorland habitat.

In addition, there is some debate about whether the Dingy Skipper (*Erynnis tages*) is present in the region. There is one unconfirmed report from Aberdeenshire, but as an over-looked species, it could be present in other parts of the Region.

### **Species at the edge of their range**

Some species are rare in the Region, but this is because they are at the edge of their UK range, and are much more common in neighbouring areas. From a UK perspective these species do not need resources directed to them.

Large Skipper	<i>Ochlodes venata</i>
Comma	<i>Polygonia c-album</i>
Wall Brown	<i>Lasiommata megera</i>
Speckled Wood	<i>Pararge aegeria</i>

A full list of the butterflies recorded in the Region is given in Appendix V. A full list of the butterflies recorded by local authority area can be found in Sivell and Phillips (1999).

### 3.2 Key Butterflies for Eastern Scotland

The table below shows high and medium priority butterflies in the Region. Note that these ratings are for guidance, and may change in the light of further recording.

High Priority		Justification
Large Heath	<i>Coenonympha tullia</i>	UK Species of Conservation Concern Declining
Mountain Ringlet	<i>Erebia ephron</i>	UK Species of Conservation Concern Large proportion of UK population
Northern Brown Argus	<i>Aricia artaxerxes</i>	UK Priority Species
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>	UK Priority Species
Small Blue	<i>Cupido minimus</i>	UK Species of Conservation Concern Rare
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	UK Species of Conservation Concern Declining
Medium Priority		
Scotch Argus	<i>Erebia aethiops</i>	Declining

### 3.3 Moths

The determination of regional priorities for moths has drawn on the following sources of information:

- UK BAP (DETR, 1995, 1999a & 1999b);
- British Red Data Book for Insects (Shirt, 1987); and
- Bland and Young (1996).

The Red Data Book used the following categories based primarily on rarity, i.e. RDB1 (Endangered), RDB2 (Vulnerable) and RDB3 (Rare). Most of the RDB-category moths in Scotland are on the UK BAP lists. RDB species that are not included on the UK BAP lists (and are also omitted from this plan) are rare but stable and are not perceived to be under any threat.

The paper by Bland and Young assessed moths in terms of rarity, threat, and knowledge of their ecology, and includes a number of species of “micro-moth” in the high threat categories. However, in general, little is known of the biology or habitat requirements of micro-moths, and in some cases their distribution is very poorly known. The prime actions for these species, which often require specialist identification, is further survey and research work, and protection of sites where rare species are known to occur. Thus for now we have omitted micro-moths from the priority lists (see Appendix III).

Ideally, regional priorities would be determined using the criteria in the Regional Action Plan guidelines, as has been done for the butterflies, but the data are generally not good enough to examine regional rates of decline, rarity or proportion of the UK resource. We would hope that the list and priorities could be revised in the light of additional recording over the next few years.

### 3.4 Key Moths of Eastern Scotland

The list below shows the regional ratings given to moths in the Region. Note that these ratings are for guidance, and may change in the light of further recording.

High Priority		Justification
Argent and Sable	<i>Rheumaptera hastata</i>	UK Priority Species
Barred Tooth-striped	<i>Trichopteryx polycommata</i>	UK Priority Species
Cousin German	<i>Paradiarsia sobrina</i>	UK Priority Species
Dark-bordered Beauty	<i>Epione vespertaria</i>	UK Priority Species
Lunar Yellow Underwing	<i>Noctua orbona</i>	UK Priority Species
Narrow-bordered Bee Hawk	<i>Hemaris tityus</i>	UK Priority Species
Netted Mountain moth	<i>Macaria carbonaria</i>	UK Priority Species
Northern Dart	<i>Xestia alpicola</i>	UK Priority Species
Square-spotted Clay	<i>Xestia rhomboidea</i>	UK Priority Species
Sword Grass	<i>Xylena exsoleta</i>	UK Priority Species
Medium Priority		
Broad-bordered White Underwing	<i>Anarta melanopa</i>	UK Species of Conservation Concern
Broom Tip	<i>Chesias rufata</i>	UK Species of Conservation Concern
Grey Scalloped Bar	<i>Dyscia fagaria</i>	UK Species of Conservation Concern
Kentish Glory	<i>Endromis versicolora</i>	UK Species of Conservation Concern
Northern Arches	<i>Apamea zeta assimilis</i>	UK Species of Conservation Concern
Rannoch Brindled Beauty	<i>Lycia lapponaria</i>	RDB 3
Rannoch Sprawler	<i>Brachionycha nubeculosa</i>	UK Species of Conservation Concern
Slender-striped Rufous	<i>Coenocalpe lapidata</i>	UK Species of Conservation Concern
Mountain Burnet	<i>Zygaena exulans</i>	UK Species of Conservation Concern
Small Dark Yellow Underwing	<i>Anarta cordigera</i>	UK Species of Conservation Concern
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	UK Species of Conservation Concern

## **4 Species Accounts: Butterflies**

### **4.1 Rationale**

The species accounts are presented as follows:

#### **Ecology**

Brief information is provided on ecology, behaviour and habitat requirements. More detail will be found in the Action Plans published by DETR (also available on the Joint Nature Conservation Committee - JNCC - web site at <http://www.jncc.gov.uk/ukbg>), and by Butterfly Conservation (Appendix VI). Plant names are given according to Stace (1997).

#### **Status**

Whether listed in the UK BAP or Red Data Book, and any legal protection.

#### **Distribution**

Distribution is summarised under three sub-regions:

*North:* Aberdeenshire and Aberdeen.

*Central:* Angus, Perthshire & Kinross, Dundee, Fife and Clackmannan.

*South:* Falkirk, the Lothians, Edinburgh, and the Borders.

#### **Threats**

These include current and potential threats to colonies. Note that, in addition to those threats given, neglect or abandonment can be just as damaging as unsuitable management.

#### **Site Safeguard & Management**

Reserves or other areas where species have been are targeted for appropriate management. This section is likely to be deficient as the knowledge on what is being done for various species is currently fragmented, something we are hoping to rectify.

#### **Advisory**

Any ongoing species-specific advisory work or recent literature on local distribution, habitat management etc. Advisory work broadens out to policy work on issues such as agri-environment and forestry, and is primarily undertaken by Butterfly Conservation staff.

#### **Research & Survey**

Any recent research or survey work.

#### **Monitoring**

Any known current monitoring of populations.

## **Action**

### *Butterfly Conservation's targets*

We have tried to define targets that are ambitious but realistic in view of the increasing amount of resources we hope will be available for biodiversity work.

A key action is often to identify “core” colonies, i.e. large colonies that may support a number of surrounding smaller colonies, and are thus crucial for the long-term persistence of a species in an area.

### *Potential Partners*

We have attempted to identify appropriate organisations who may be able to assist us with certain actions. We do however recognise that organisations have limited resources, and will not necessarily be able to commit themselves to many of these actions. We also recognise that landowners and managers are essential partners to almost all that we want to achieve. That an organisation is not listed may be an oversight, and the list of partners suggested is not meant to be exclusive. Some agencies felt only able to commit themselves to actions identified in the UK plans at this stage.

### *Local Volunteers*

In almost all cases, there will be a crucial role for local volunteers, whether affiliated to Butterfly Conservation or to other groups, or acting as individuals, or working through their Local Biodiversity Action Plans.

## 4.2 High Priority Species

### Large Heath (*Coenonympha tullia*)

#### Ecology

A species of lowland raised bog, damp acidic moorland and upland blanket bog where the larval foodplant, hare's-tail cottongrass (*Eriophorum vaginatum*) occurs. It has declined at the southern and eastern edges of its range in the UK through the loss of lowland peat bogs. For detailed information on ecology and management see Bourn & Warren (1997).

#### Status

A UK Species of Conservation Concern. Listed in the Bern Convention as a European species under threat, and listed as threatened in Europe in the new European Red Data Book (Swaay & Warren, 1999). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

#### Distribution

Widely distributed in the upland areas of Aberdeenshire and Perthshire but scarce elsewhere. Although there may have been some losses due to habitat change, any real decline may be masked by under-recording. Surveys are thus urgently needed to accurately assess the situation.

<i>North</i>	Distribution centred on upland areas in and adjacent to Deeside. Potential sites near the coast need to be checked (e.g. it was only recently found on both Rora and Red Mosses, Aberdeenshire).
<i>Central</i>	Widespread in north Perthshire, though apparently rare in Angus, and just a single site in Fife.
<i>South</i>	Its apparent scarcity in this area strongly contrasts with its distribution on the English side of the Border (Eales 1999, Eales & Dennis 1998). Declines have certainly occurred, but under-recording could be a factor.

#### Threats

Habitat loss through peat extraction. Drainage, for either agricultural improvement or forestry. Over-grazing.

#### Site Safeguard & Management

No examples of management specifically for this species are known in the Region. Eales (1999) and Eales and Dennis (1998) provide detailed information on habitat requirements.

#### Research & Survey

No systematic survey has been attempted.

#### Monitoring

Recorded occasionally on the Morrone Birkwood BMS transect. Not apparently recorded on any independently-monitored sites in the region.

**Action**

Note that in general, action to conserve lowland raised and blanket bogs will help to conserve the Large Heath. However, restoration of some lowland bogs has caused problems when water levels have been raised too high (Joy & Pullin, 1997).

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify and protect core sites on lowland bogs	2002	FC, FE, LA, Owners, SWT
Provide guidance to land management advisers	2002	SNH, FC
Provide owners of all core lowland bog sites with management guidelines	2002	FC, FWAG, SAC, SNH, SWT
Survey all lowland bog sites with no post-1995 records, and potential sites	2002	LBAP, SWT
Establish monitoring on at least two core lowland bog sites	2002	LBAP, SWT

## **Mountain Ringlet** (*Erebia epiphron*)

### **Ecology**

This is a montane or sub-montane species which favours slightly base-rich grassland habitats at 350-800m altitude (McGowan, 1997). The larvae feed on the mat-grass (*Nardus stricta*), and possibly other species. Little is known about its habitat requirements, but it seems to be associated with herb-rich grassland. For information on ecology and management see Ravenscroft & Warren (1996b), although a great deal remains to be discovered.

### **Status**

A UK Species of Conservation Concern. It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

### **Distribution**

This species has a west/central distribution in the Scottish Highlands, and occupies the mountainous area where the three Butterfly Conservation Regions meet. The proportion of the whole UK distribution falling into our Region is probably around 20-25%, though it could be higher if all previously reported sites were to be confirmed.

Numbers fluctuate widely from year to year and may be undetectable in low years. This, coupled with its montane habitat, and its penchant for only flying in numbers in full sunshine, mean it is certainly under-recorded.

<i>North</i>	There are recent records for the mountains at the head of Glen Clova, Angus.
<i>Central</i>	The distribution is centred on the Breadalbane Hills and Rannoch. Sites further north between Drumochter and Glen Tilt require checking.
<i>South</i>	Not recorded.

### **Threats**

Over-grazing, and perhaps, under-grazing.  
Climate change  
Afforestation

### **Site Safeguard & Management**

The precise habitat requirements are as yet little known, but most sites tend to be south-facing, contain species-rich flushes, and are lightly sheep-grazed.

### **Research & Survey**

McGowan (1997) has reported the results of a three-year study by the CEH into habitat preferences. Butterfly Conservation encouraged recording in 1999, using returnable postcards.

### **Monitoring**

Recorded for the Butterfly Monitoring Scheme by NTS at Ben Lawers, one of only two sites in Britain currently monitored for this species. Because of frequently adverse weather during the flight season, transect monitoring of adults is particularly difficult for this species.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify and protect core sites	2004	LBAP, Owners
Provide guidance to land management advisers	2004	CEH, NTS
Provide owners of all core sites with management guidelines	2004	FWAG, SAC, SWT
Survey all sites with 20 <sup>th</sup> C. records	2004	CEH, LBAPs
Encourage research on habitat requirements	2004	CEH/NTS/universities
Continue monitoring at Ben Lawers	annually	NTS

## **Northern Brown Argus** (*Aricia artaxerxes*)

### **Ecology**

This species, which has its stronghold in eastern Scotland, is largely coastal in the South West. It requires sunny south-facing, lightly-grazed or ungrazed slopes where the foodplant common rock-rose (*Helianthemum nummularium*) is present. Many sites are small, less than one hectare in extent. For detailed information on ecology and management see Ravenscroft & Warren (1996a).

### **Status**

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

### **Distribution**

This species had its stronghold in Britain in this region, with perhaps more than 40% of all British (and UK) records. This species has been subject to intensive survey which has greatly increased the number of known sites. It is however almost entirely absent from agricultural land and there have certainly been losses due to habitat change.

<i>North</i>	Present in the Grampians and sites near Aberdeen. Several sites on the coast and in Deeside require survey.
<i>Central</i>	Widespread in discrete colonies, though under-reported in parts of western Perthshire. Present on sites in the Sidlaws between Perth & Dundee and two coastal sites in Fife.
<i>South</i>	Several colonies have recently been (re)discovered, although there have undoubtedly been numerous losses, primarily through loss of habitat. Present in the Lothians, Ochils and Borders.

### **Threats**

Over-grazing, and more rarely under-grazing  
Habitat loss. Afforestation.

### **Site Safeguard & Management**

Management prescriptions are outlined by Ellis (1998) who studied six sites in Scotland, three of which were in this region. At most sites appropriate management is likely to depend on maintaining low intensity grazing levels, although this species also occurs on a number of thin-soiled sites which are not grazed.

### **Advisory**

The species' requirements should be built into prescriptions for grassland supporting common rock-rose.

### **Research & Survey**

The SDLP (Pearce *et al.* 1999) searched many sites with common rock-rose without records of the Northern Brown Argus, looking for adults and eggs. A high proportion of these searches were successful.

### **Monitoring**

Recorded on the BMS transect at St Cyrus NNR, and occasionally at Morrone Birkwood. It is also monitored independently at St Abb's Head. Monitoring by egg-counts is practical for this species.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify and protect core sites from damage or inappropriate management	2002	FC, LBAPs, SNH, Owners
Provide guidance to land management advisers	2002	LBAPs, SNH
Provide owners of all core sites with management guidelines	2002	FWAG, SNH, SWT
Survey all sites with no post-1995 records	2002	LBAPs, SNH
Establish monitoring on at least three core sites	2002	LBAP, NTS, SNH

## **Pearl-bordered Fritillary** (*Boloria euphrosyne*)

### **Ecology**

This species occurs in bracken (*Pteridium aquilinum*) and scrub mosaics, woodland edge and open woodland. Coppice woodland and young conifer plantations can also support colonies, and electricity powerline wayleaves can also be a valuable habitat in closed canopy woodland.

The main larval foodplant is common dog-violet (*Viola riviniana*), but almost all sites are sunny, south-facing, and have a bracken component. For detailed information on ecology and management see Brereton *et al.* (1999) and Barnett & Warren (1995a).

### **Status**

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1995). It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

### **Distribution**

Currently recorded from around 20 ten km squares in the North East and Central areas, but entirely absent from the southern part of the region. Though apparently widespread in the last century, its decline there is not a recent phenomena.

Intensive survey in 1997-98 (Brereton *et al.*, 1999) relocated many sites, though at least eight ten km squares have still to be surveyed. Most sites have only small populations so probably many colonies may be still be overlooked.

<i>North</i>	Stronghold in Deeside and adjacent mountain valleys. Reported up to 600m in the Cairngorms (McAlpine 1979).
<i>Central</i>	Widespread throughout parts of Perthshire, though only a single site is known from Angus. Recent reports from southern Angus and Fife are known to be erroneous, though apparently reported around Perth and Kincardine in the last century (Thomson 1980).
<i>South</i>	No current reports, although recorded from 10 ten km squares in the last century (Thomson 1980).

### **Threats**

Scrubbing over of woodland glades e.g. in woodland regeneration programmes where grazers are excluded.

Afforestation of grassland/bracken habitats.

Over-grazing in open woodland, or woodland edge habitats.

Bracken eradication in some areas, in others, a lack of bracken management.

### **Site Safeguard & Management**

This species requires short, sparse vegetation in sheltered, sunny sites with an abundance of violets. Management requires spatial and temporal continuity of clearings in woodland, maintenance of light to moderate bracken cover (Brereton & Warren 1998). Plantation management should ensure the removal of brush following felling operations from south-facing sites to encourage violets (MacKay, 1999a).



The main recommendations are:

1. Wayleave management should be undertaken, cutting on a 5-15 year rotation
2. Maintain extensive light grazing to prevent over-dominance by bracken
3. Careful planning and control is needed of bracken-spraying, where this is used

### **Advisory**

Ongoing work with FC, especially with respect to woodland grant schemes. An advice note has been prepared for SNH on distribution, ecology and conservation by Butterfly Conservation.

### **Research & Survey**

Butterfly Conservation organised a major project through 1997-8, carrying out surveys and researching habitats (Brereton *et al.*, 1999). More information is required on how to maintain suitable open habitat within both semi-natural broadleaved woodland, and conifer plantations.

### **Monitoring**

Recorded on the BMS transect at Morrone Birkwood, and occasionally at Ben Lawers. Not apparently monitored on any other sites.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify core sites	2001	SNH
Protect core sites from damage or inappropriate management	2001	SNH, FC, LA, SERAD, Owners
Provide guidance to land management advisers	2001	SNH
Provide owners of all core sites with management guidelines	2001	FC, FWAG, SAC, SNH, SWT
Survey all sites, including those with no post-1995 records, and potential sites	2004	LBAP, SNH
Encourage research on management methods within woodland	2001	FC, FE, SNH
Establish monitoring on at least two core sites	2001	FE, NTS, RSPB, SNH

## **Small Blue** (*Cupido minimus*)

### **Ecology**

The UK's smallest butterfly, it is a species of sheltered, sunny, lightly-grazed or ungrazed base-rich grasslands, disused railway cuttings and coastal dunes, where its larval foodplant, kidney vetch (*Anthyllis vulneraria*), is abundant. For detailed information on ecology and management, see Bourn & Warren (2000).

### **Status**

A UK Species of Conservation Concern. It is protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

### **Distribution**

Distribution is in two main discrete areas - in scattered colonies along the north coast and the southern part of Angus. Currently reported in 10 ten km squares.

- North* Known from a few 10 km squares on the north Aberdeenshire coast, forming a virtually continuous distribution with colonies in Moray to the west. There were a number of sites around Aberdeen until the late 1980's. These sites require checking.
- Central* There is a strong presence in coastal Angus, with some colonies inland. A former site at North Queensferry, Fife was destroyed by a housing estate during 1980's.
- South* Only one colony is thought to remain, near Hawick, but there have apparently been no records since 1998.

### **Threats**

Habitat loss through development.  
Succession, i.e. scrubbing over of old railway tracks  
Coastal erosion, and possibly recreational pressure.  
Development.

### **Survey**

A survey of coastal sites in Banffshire (part of which is now falls within Aberdeenshire) was carried out for the SDLP in 1995 by Leverton and Smith located seven colonies within our region (Barbour, 1999a). Coastal sites in Angus were surveyed by Fulford in 1993 and Harris in 1994 (Pearce *et al.* 1996), and several new sites were located on abandoned railway lines inland.

### **Monitoring**

Not recorded on the BMS transect at St Cyrus, although present nearby. Not on any other BMS transects in the region. The Small Blue can be monitored by counting eggs.

## Management

Some limited habitat management has been carried out by East of Scotland Branch at the site near Hawick.

<b>Actions</b>	<b>BC's Targets</b>	<b>Possible Partners</b>
Confirm status of Hawick site	2001	LBAP, SNH
Identify and protect core sites	2002	LBAPs, Owners
Provide guidance to land management advisers	2002	LBAPs
Provide owners of all inland sites with management guidelines	2002	FWAG, SAC, SWT
Survey all known and potential inland sites	2002	LBAPs, SNH
Establish monitoring on at least one coastal and one inland sites	2002	LBAP, SNH, SWT, RSPB

## Small Pearl-bordered Fritillary (*Boloria selene*)

### Ecology

This is a species of damp, lightly-grazed or ungrazed semi-natural grassland, open deciduous woodland, marsh and moorland habitats. Marsh violet (*Viola palustris*) is the larval foodplant on wetter sites, while on dry sites, common dog-violet (*V. riviniana*) is used. For detailed information on ecology and management see Barnett & Warren (1995b).

### Status

A UK Species of Conservation Concern, primarily due to large-scale, recent and rapid declines in lowland England.

### Distribution

Widespread and locally common, though scarce and declining in the south of the region.

*North* Scarce in the intensively-farmed parts of Banff and Buchan, largely restricted to lowland mosses. Parts of Deeside, the north east coast and north of Aberdeen require survey.

*Central* Locally common and widespread in Perthshire and Fife. A number of new sites have been found recently in the south of Angus.

*South* Present in West Lothian and Edinburgh, but few recent reports from Borders. This may be due to under-recording, but some sites have been lost.

### Threats

Agricultural improvement and site drainage. Succession following abandonment of grazing. Housing & industrial development. Afforestation of wetland margins.

### Site Safeguard & Management

Management is necessary to maintain it open habitat e.g. through light grazing (preferably by cattle) on its wet grassland sites.

### Survey

No systematic survey has been made. During the recent Pearl-bordered Fritillary surveys several new records were made of this species, since the two sometimes co-exist.

### Monitoring

Represented regularly on two BMS transects, the Sands of Forvie and Culvie Wood, and occasionally at Ben Lawers.

Action	BC's Targets	Possible Partners
Provide guidance to land management advisers	2002	LBAPs
Continue monitoring established sites	annually	LBAPs
Survey all recorded sites in the Lothians & Borders to ascertain status	2002	LBAPs

### 4.3 Medium Priority Species

#### Scotch Argus (*Erebia aethiops*)

##### Ecology

A species of sheltered, lightly-grazed damp grasslands, woodland edges and plantations. Within moorland it tends to be confined to sheltered marshy areas or burn sides. Purple moor-grass (*Molinia caerulea*) has been assumed to be the predominant larval foodplant in Scotland, but it does use other species elsewhere (Kirkland, 1995).

##### Status

Not listed in the UK BAP.

##### Distribution

Widespread and common in parts of the North East and Central areas, but entirely absent from the coast, except the Moray Firth. It is known to be spreading in the Moray/Aberdeenshire area, but has declined in the Borders, where it has a very restricted distribution. The current data imply a 40% decline, but this could be due partly to under-recording

<i>North</i>	Found locally in upper Deeside, but more common in the north west in Banffshire.
<i>Central</i>	Almost entirely restricted to hills of northern Perthshire and Angus. Absent from Kinross, Fife and Clackmannan.
<i>South</i>	Apparently confined to small area around Selkirk in the Borders, with current records from only five or six 10 km squares.

##### Threats

Drainage and “reclamation” of moorland. Over-grazing.  
Loss of open areas within woodland.

##### Survey

No systematic survey has been made.

##### Monitoring

Recorded on the BMS transects at Whitlaw Mosses in the Borders, and Culvie Wood, Aberdeenshire, and occasionally at Morrone Birkwood.

##### Management

Thought to need lightly-grazed grassland with scrub or open woodland.

Action	BC's Targets	Potential Partners
Survey historic sites in the Borders to ascertain status	2005	LBAP
Provide guidance to land management advisers	2005	LBAPs
Continue monitoring on	Annually	NTS, SNH

established sites		
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## 5 Species Accounts: Moths

### 5.1 Rationale

The format of the accounts broadly follows those for the butterflies (see section 4.1).

The species accounts for the moths are necessarily shorter than those for the butterflies as usually far less is known about ecology, distribution, management requirements and threats. With the exception of the rarer Burnet and Forester moths (*Zygaenidae*), being tackled by the Burnet Study Group (see later), few moth species are currently being targeted for active conservation measures in South West Scotland.

Thus in several cases, the only specific action points that have been suggested are for surveys to clarify distribution, and sometimes to carry out basic research into habitat requirements and larval foodplants. In virtually every species the most urgent need is for more comprehensive information on distribution.

#### *Potential Partners*

The **Burnet Study Group** is made up of individuals and organisations involved in the conservation of the rarer Burnet moths in Scotland. Members include SNH, NTS and Butterfly Conservation. The Convenor is Dr Mark Young of Aberdeen University.

## 5.2 High Priority Species

### Argent and Sable (*Rheumaptera hastata*)

#### Ecology

This moth, which can be seen flying in the daytime, can occur in woodland where the larvae feed on birch (*Betula* spp.). However, the subspecies in this Region is presumed to be *Rheumaptera hastata nigrescens*, which is found on open moorland and bogs, where the larval foodplant is bog-myrtle (*Myrica gale*).

#### Status

A UK Priority Species (DETR, 1999b).

#### Distribution

This species has a predominantly western distribution in Scotland and records from this Region represent the most easterly edge of its range. The moth is widespread and locally common in the western part of the Highlands, and there is no real evidence for a decline in these areas. The loss of colonies of this species have been predominantly amongst the woodland populations further south (subspecies *hastata*).

*Central* The subspecies *nigrescens* is known from several pre-1980 records in the Rannoch area, Perthshire, with no recent records.

#### Threats

Over-grazing and lack of bog-myrtle regeneration. Drainage of wetland habitats.

Action	BC's Targets	Potential Partners
Survey historic sites to ascertain status	2005	LBAP, SNH

### Barred Tooth-striped (*Trichopteryx polycommata*)

#### Ecology

Inhabits open woodland and heathland with shrubs. The larvae feed on ash (*Fraxinus excelsior*) in Scotland, but also on wild privet (*Ligustrum vulgare*) in England and Wales.

#### Status

A UK Priority Species (DETR, 1999b).

#### Distribution

Apparently always a local though widespread species within Britain. In Scotland, reported recently from Ardnamurchan, Inverness-shire, Thornhill (Dumfries and Galloway), Kirkcudbright, Arran and Canna, but no recent confirmed records in the Region. There is however a recent, unconfirmed record from Perthshire.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	SNH

## **Cousin German** (*Paradiarsia sobrina*)

### **Ecology**

This moth is associated with birch woodland and old, open Caledonian pine forest. The larvae are thought to feed initially on blaeberry/bilberry (*Vaccinium myrtillus*) or heather/ling (*Calluna vulgaris*), but are thought to switch to birch (*Betula* sp.) in Spring to complete their development.

### **Status**

A UK Priority Species (DETR, 1999a).

### **Distribution**

*North* There are records for Dee valley, where it is regularly found in the upper valley.

*Central* Recent records from Rannoch and other sites in north Perthshire such as Killiecrankie.

### **Threats**

Perhaps locally, conifer afforestation. The ecology is not well enough understood to be specific about other possible threats, though heavy grazing has been suggested as one.

### **Site Safeguard & Management**

Like the Kentish Glory (see later), this moth seems to favour extensive open areas of young regenerating birch with blaeberry, although it can occur in more mature open woodland. Any management which aims to favour these species should aim to keep significant areas of habitat in this essentially transitional stage, alongside more mature woodland.

<b>Action</b>	<b>BC's Targets</b>	<b>Possible Partners</b>
Monitor at least one key site	2002	SNH
Encourage research on ecology and habitat requirements.	2005	FC, RSPB, SNH

## **Dark Bordered Beauty** (*Epione vespertaria* [= *paraellaria*])

### **Ecology**

On Deeside the Dark-bordered Beauty is associated with suckering or regenerating aspen (*Populus tremula*) of not more than about one metre high. It is thought that at the Borders site, a lowland moss which has no aspen, the caterpillars feed on creeping willow (*Salix repens*), as they do on the two sites in northern England.

### **Status**

A UK Priority Species (DETR, 1999a).

### **Distribution**

There only two recently confirmed sites in Scotland, one in Speyside, the other in Deeside. Both are on private land and are confidential. There are two sites in northern England.

*North* A single site is known on Deeside, where it has been recorded regularly in recent years.

*South* Known from only a single site in Roxburghshire, but its current status there is uncertain, as there are no records since the 1970s.

### **Threats**

Over-grazing.

### **Management**

Aspen suckers and saplings are very sensitive to grazing by livestock or rabbits. In the absence of grazing active woodland management may be required. A wayleave cut through the Deeside site in the early 1990's seems to have created ideal habitat temporarily for the moth. SNH commissioned survey of this and the other Scottish colonies in 1998 (Barbour, 1999b).

A project began in 2000 involving Butterfly Conservation, RSPB, SNH and the local BAP partnership, which aims to establish regular monitoring, enhance management of the site and to carry out surveys of suitable habitat and encourage research.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey of potential sites in Deeside	2001	LBAP, RSPB, SNH
Survey Borders site to ascertain status	2001	LBAP, RSPB, SNH
Provide owners with advice and assist site management	2001	FC, FWAG, SNH
Encourage research on ecology and habitat requirements.	2001	FC, RSPB, SNH
Establish monitoring programme	2001	LBAP, SNH

## **Lunar Yellow Underwing** (*Noctua orbona*)

### **Ecology**

Found on sand dunes, in open woodland on light soils, and moorlands, it has undergone steady decline throughout its range in UK. The larvae feed on grasses including cock's-foot (*Dactylis glomerata*) and common couch (*Elytrigia repens*), and a variety of herbaceous plants, such as buttercups (*Ranunculus* spp).

### **Status**

A UK Priority Species (DETR, 1999b).

### **Distribution**

Distribution requires clarification. The two records reported below are the only recent records known for the whole of Scotland.

*North* Recorded as a single specimen from Cornhill, Aberdeenshire in 1995. There are also two pre-1980 records from Deeside.

*Central* The only post-1980 site is at Tentsmuir, Fife., but previously it has also been reported from Buddon, Angus.

*South* There are ten pre-1980 10 km squares with records from the Borders.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey to clarify distribution and status	2003	FE, RSPB, LBAP, SNH
Encourage research on habitat, mobility and population structure	2003	FC, SNH

## **Narrow-bordered Bee Hawk-moth** (*Hemaris tityus*)

### **Ecology**

This diurnal moth occurs on unimproved wet grasslands, the margins of peatbogs, moorland and occasionally woodland. The larval food plant is devil's-bit scabious (*Succisa pratensis*), and this species does sometimes occur on the same sites as the Marsh Fritillary (no longer found in this Region).

### **Status**

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999a).

### **Distribution**

Formerly widespread in Britain, but has declined in recent years. It is now largely confined to western Britain, with no recent records for the Region. It has however been seen more widely in Speyside (Highlands) in recent years, and so could still be present in Deeside.

*North* Four pre-1980 10 km square records from Aberdeenshire, three of these being from Deeside.

*South* Three pre-1980 records exist, from East Lothian and the Hawick area.

### **Threats**

Agricultural improvement/drainage of wet grassland, heathland and bogs. Over-grazing. Afforestation. Cessation of grazing, and subsequent loss of foodplant.

### **Site Safeguard & Management**

Light grazing is assumed to be the preferred management, retaining the foodplant in the sward, but exact requirements are not known.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Survey historic sites to ascertain status	2001	LBAP, SNH

## **Netted Mountain Moth** (*Macaria [=Semiothisa] carbonaria*)

### **Ecology**

This is one of the characteristic species associated with bearberry (*Arctostaphylos uva-ursi*) and associated with *Arctostaphylos/Calluna* heath, which is peculiar to the eastern Highlands. The name “Mountain” moth is rather inappropriate as the majority of populations occur at moderate or intermediate altitudes. The moth also occurs in areas of sparser bearberry at high altitudes.

### **Status**

A UK Priority Species (DETR, 1999a).

### **Distribution**

The distribution of the habitat was surveyed for NCC by Urquhart (1986) and the associated Lepidoptera by Young (1989).

*North*            There are post-1980 records for three 10 km squares in the Dee valley and a further two pre-1980 records.

*Central*         Pre-1980 records from Rannoch, and from the Forest of Clunie near Dunkeld.

### **Threats**

The *Arctostaphylos/Calluna* heath habitat occurs at moderate-to-intermediate altitudes on well-drained ground, and as such it has been reduced by both afforestation and birch regeneration in the past. Recognition of the importance of this habitat type should mean that afforestation proposals are less likely to be approved in future. An additional and important threat is the lack of muirburn, which tends to favour ling at the expense of bearberry. Excessive burning is also damaging. Moderate grazing is unlikely to be harmful.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify and protect core sites	2003	FC, SNH, Owners
Provide guidance to land management advisers	2003	SERAD, SNH
Provide owners of all core sites with management guidelines	2003	FWAG, SAC, SNH
Survey all known and potential sites	2003	LBAP, SNH
Encourage research on habitat requirements	2003	LBAP, SNH
Establish monitoring on at least two core sites	2003	LBAP, SNH

## Northern Dart (*Xestia alpicola*)

### Ecology

Essentially a montane species, occurring in association with the its main larval foodplant, crowberry (*Empetrum nigrum*) at altitudes over 450 metres. Occurs sporadically in light traps at lower altitudes, which may give false impression of its true distribution.

### Status

A UK Priority Species (DETR, 1999a).

### Distribution

It has a two year life-cycle and adults are apparently reported only in even-numbered years.

*North* Confirmed from four 10 km squares in the hills of Aberdeenshire and Banffshire, but probably still widespread.

*Central* Formerly recorded south of Loch Rannoch, where it is likely to still be present.

*South* There is a pre-1980 record from the Lanark area.

### Threats

Irresponsible collecting, by ripping up large areas of moss/lichen where the larvae pupate, has been a very localised threat in past years. There are few other threats to its montane habitat.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

## Square-spotted Clay (*Xestia rhomboidea*)

### Ecology

This species occurs in broad-leaved woodland, where the larvae feed on birch (*Betula* spp.), blackcurrant (*Rubus fruticosus*) and other species.

### Status

A UK Priority Species in the UK BAP, with a published action plan (DETR, 1999b).

### Distribution

Known from only about 15 sites in Scotland, with few recent records.

*Central* There are a number of pre-1980 records for three 10 km squares in the Blairgowrie and Strathardle area.

*South* A recent record from Ettrick Forest, and a pre-1980 record from near St Abbs.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	LBAP, SNH
Ensure all colonies receive appropriate management	2004	FC, SERAD, SNH

Encourage research on habitat requirements and foodplants	2004	FC, SNH
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## **Sword-grass** (*Xylena exsoleta*)

### **Ecology**

This moth is found in open woodland and on the edges of moorland, extending into lowland agricultural areas, but little is known of its ecology. The larval food plants in the wild are not known, although it is thought to feed initially on grasses, moving on to broad-leaved species. In captivity, larvae will feed on blackthorn (*Prunus spinosa*) and bird cherry (*P. padus*).

### **Status**

A UK Priority Species (DETR, 1999a).

### **Distribution**

Formerly widespread throughout the Region, but with a lack of recent records for some areas. However it is still quite frequently reported other areas. Therefore it is not clear whether there has been a real decline, or just a lack of recording.

<i>North</i>	Known from several 10 km squares from scattered locations between the Ladder Hills in the west and the Aberdeen coast and probably still widespread throughout the area.
<i>Central</i>	Recent records from Rannoch, with older records from Blairgowrie and the Kinross area.
<i>South</i>	Formerly widespread at both inland and at coastal localities in the Borders, but with very few recent records.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey to assess status	2005	SNH
Encourage research on habitat and ecology	2005	SNH

## 4.2 Medium Priority Species

### **Broad-bordered White Underwing** (*Anarta melanopa*)

#### **Ecology**

A montane species, occurring at over 600 metres often associated with *Rhacomitrium* heath, with its main stronghold is in the Cairngorms. Larvae feed on crowberry (*Empetrum nigrum*) and other members of the heather (*Ericacea*) family.

#### **Status**

A UK Species of Conservation Concern.

#### **Distribution**

This is one of our truly montane species, occurring at over 600metres altitude in a number of widely-separate areas. However its main stronghold is in the Cairngorms. Its recent distribution is under-recorded, because of the infrequency of visits to these remote sites, and it remains widespread. There are also pre-1980 records from sites just outside the Borders area, in Dumfries & Galloway, and Northumberland, and may yet be found there.

*North* Several recent records from the Eastern Cairngorms.

*Central* Recent records from Glas Meol, and older records from the Ben Vrackie area.

#### **Threats**

Damage to crowberry through poor muirburn at lower levels, but unlikely to be significantly threatened at present. Perhaps in the long-term, global warming may have some impact.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey to clarify distribution and status	2005	LBAP
Provide guidance to land management advisers	2005	SERAD, SNH

**Broom-tip** (*Chesias rufata*)

**Ecology**

This species inhabits moorland, heathland, and coastal areas with established broom (*Cytisus scoparius*) bushes, the larval food plant.

**Status**

A UK Species of Conservation Concern.

**Distribution**

*North* Numerous pre-1980 records from Aberdeenshire, but few recent records.

*Central* Again several older records for Angus and Perthshire, Fife and Falkirk, but very few recent ones.

*South* Never recorded.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAPs

**Grey Scalloped Bar** (*Dyscia fagaria*)

**Ecology**

This is a moorland species which feeds on heather/ling (*Calluna vulgaris*), but little is known of its habitat requirements.

**Status**

A UK Species of Conservation Concern.

**Distribution**

Although a national decline has been detected, this species still shows a good scatter of records in the Region, particularly in western parts. However, there are many records for the Borders and Lothians that have not recently been repeated. Its ecology so far as it is known provides no clue to the reasons for a decline.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

## **Kentish Glory** (*Endromis versicolora*)

### **Ecology**

The ecological requirement is for young silver birch *Betula pendula*, of not more than about two or three metres in height, in extensive but open stands (Barbour and Young, 1993).

### **Status**

A UK Species of Conservation Concern.

### **Distribution**

Two of the species' four Scottish (and UK) distribution areas fall within the Region. Single records have come from other areas from time to time.

*North* Confined to upper and mid Deeside, as far east as Banchory.

*Central* Occurs at Rannoch and the upper Tay valley, Perthshire.

### **Threats**

As the species depends on large areas of young birch, threats include lack of regeneration due to grazing or burning, and also succession to woodland.

### **Site Safeguard & Management**

In conifer plantations, felled areas may become colonised by young birch and can then provide suitable habitats for perhaps ten years until re-planted conifers become dominant again. If this process continues in a rotation, a permanent colony of the moth may be able to survive, although extensive areas of birch are needed. Forest managers should thus limit the 'weeding' of young birch, and encourage its regeneration.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Survey all known and potential sites	2005	FE, LBAP, SNH
Identify and protect core sites	2005	FC, FE, SERAD, SNH, Owners
Provide guidance to land management advisers	2005	FC, SERAD, SNH
Provide owners of all core sites with management guidelines	2005	FWAG, SAC, SNH
Establish monitoring within the two core sites	2005	FE, LBAP, SNH

## Mountain Burnet (*Zygaena exulans*)

A montane species found at altitudes above 600m (2000ft). Larva feeds on crowberry (*Empetrum nigrum*), and other plants in grassy heaths. This species has one of the most restricted distributions of any Lepidoptera in Britain, only being recorded in this Region.

### Status

A UK Species of Conservation Concern.

### Distribution

*North* Known only from few localities near Braemar, Aberdeenshire, but there have been reports of possible colonies at additional sites.

### Threats

Not known, but apart from “global warming”, it seems to be unlikely there are any.

### Management

No specific management is needed.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP

## Northern Arches (*Apamea zeta*)

### Ecology

A species of upland moorland, where the larval foodplant may be purple moor-grass (*Molinia caerulea*). Little is known of its ecological requirements.

### Status

A UK Species of Conservation Concern.

### Distribution

Older records suggest this is quite widespread in the Region, but there are very few recent records. It is likely that it is a high-altitude species, with occasional vagrant individuals being caught at light-traps in lower districts.

*North* Current status unclear, but still present and apparently widespread.

*Central* Recent records from Rannoch, but status elsewhere unclear.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2005	LBAP, SNH
Encourage research on habitat requirements and foodplants	2005	SNH

## **Rannoch Brindled Beauty** (*Lycia lapponaria*)

### **Ecology**

This moth occurs on bogs and wetter moors, where the larvae feed on various heaths and bog-myrtle (*Myrica gale*), and possibly also willows (*Salix* spp.). Little is known of its ecological requirements.

### **Status**

The species qualifies as RDB3 “Rare”, but no declines are apparent. Not listed in the UK BAP, but rare in Europe.

### **Distribution**

Found from Deeside westwards across central-western Highlands and to Argyll, and south to Flanders Moss.

*North* Present in upper Deeside.

*Central* First recorded Perthshire, probably from Rannoch, but since shown to occur in a wide band across the Perthshire hills from Flanders Moss northwards in at least eight 10 km squares (Young & Knill-Jones, 1987).

### **Threats**

Not known.

### **Management**

Not known.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey to clarify distribution and status	2005	LBAP
Encourage research on habitat requirements and foodplants	2005	SNH, universities

## **Rannoch Sprawler** (*Brachionycha nubeculosa*)

### **Ecology**

This species, like the Welsh Clearwing (see later) is confined to areas of old birch woodland with a supply of large “over-mature” trees.

### **Status**

A UK Species of Conservation Concern.

### **Distribution**

Found in the Highland Region in Speyside, and Glens Affric and Moriston.

*Central* Known only from a limited area at Rannoch.

### **Threats**

In the past, birch woodland was often cleared to create conifer plantations. Nowadays this is unlikely, but some woods could still be lost through lack of regeneration.

### **Site Safeguard & Management**

Maintain continuity of age-classes in birch woodlands, retaining over-mature trees.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Survey known and potential sites	2005	FE, LBAP, SNH
Identify and protect core sites	2005	FC, LBAP, Owners
Provide guidance to land management advisers	2005	FC, LBAP

## **Slender-striped Rufous** (*Coenocalpe lapidata*)

### **Ecology**

This species occurs in rough, damp, semi-upland pasture and moorland, often with rushes (*Juncus* spp.). The larval foodplants are uncertain, but may be buttercups (*Ranunculus* spp).

### **Status**

A UK Species of Conservation Concern.

### **Distribution**

Status unclear but there are a few recent records from Rannoch and Atholl in Perthshire.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Undertake survey to clarify distribution and status	2005	LBAP, SNH
Encourage research on habitat requirements and foodplants	2005	SNH

## **Small Dark Yellow Underwing** (*Anarta cordigera*)

### **Ecology**

Like the Netted Mountain moth (see above) this is a species associated with bearberry within *Arctostaphylos/Calluna* heath, but only on lowland sites.

### **Status**

A UK Species of Conservation Concern.

### **Distribution**

The heath occurs on well-drained soils at intermediate altitudes (200-600m) in the eastern Highlands and northern Perthshire. In the survey reported by Young (1989) it was the most consistently-reported Lepidoptera species of this habitat. More colonies have been found by David Barbour and others since.

*North* Found in several straths around the Eastern Cairngorms.

*Central* Recent records from Rannoch.

### **Threats**

Afforestation.

Birch regeneration if grazing is removed or drastically reduced.

A lack of heathland management, allowing ling to shade out bearberry represents a severe long-term threat.

### **Site Safeguard & Management**

It may be possible to modify afforestation schemes so as to leave areas of suitable habitat for this and other bearberry-associated species. Traditional heathland management is beneficial.

<b>Action</b>	<b>BC's Targets</b>	<b>Potential Partners</b>
Identify and protect core sites	2005	FC, LBAP, SERAD, Owners
Provide guidance to land management advisers	2005	FC, SERAD, SNH
Provide owners of all core sites with management guidelines	2005	FWAG, SAC, SNH

## Welsh Clearwing (*Synanthedon scoliaeformis*)

### Ecology

This species is dependent on native pine woodland where silver and/or hairy birch (*Betula pendula* and *B. pubescens* respectively) historically form a component. The larvae feed on the inner bark of older birch.

### Status

A UK Species of Conservation Concern.

### Distribution

Recent surveys have located a number of new sites in the Highlands and the Trossachs (Barbour & Bland 1996), suggesting that the species is under-recorded, although it has not yet been recorded on Deeside (or Speyside in Highland Region).

*Central* Occurs at Rannoch.

### Threats

Woodland management that leads to the loss of old, “over-mature” birch.

### Site Safeguard & Management

Maintain continuity of age-classes in native birch woodlands, retaining over-mature trees. This may require very long-term management as now begun by SNH at Rannoch, since birch is an essentially short-lived tree, and even-aged stands can senesce and die with no “middle-aged” birch to replace them.

Action	BC's Targets	Potential Partners
Undertake survey to clarify distribution and status	2003	LBAP
Identify and protect core sites	2003	FC, LBAP, Owners, SNH
Provide guidance to land management advisers	2003	FC, LBAP
Provide owners of all core sites with management guidelines	2003	FWAG, SAC

## **6 Important Areas for Butterflies and Moths in the Region**

The following is an attempt to highlight the richest and most distinctive areas in the Region, but may require revision when further information becomes available.

Map 2 shows nine important areas that in some cases are contiguous, but are distinctive in their butterfly and moth fauna.

### **Rannoch & Breadalbane**

These are areas well known to moth enthusiasts, although the current status of some scarce species is less well known than it was in the last century. The Rannoch Sprawler and the Rannoch Brindled Beauty were first recorded here. The area supports populations of Kentish Glory, Welsh Clearwing and Sword Grass. There are past records for Netted Mountain Moth, Argent and Sable, Northern Dart, Cousin German, and Small Dark Yellow Underwing. This is the central part of the range of Mountain Ringlet. Scotch Argus, Large Heath and Small Pearl-bordered Fritillary also occur.

### **The Eastern Cairngorms**

Part of the largest montane area in Britain, with substantial areas above 1000 metres. The mountains around Cairngorm have Northern Dart, Broad-bordered White Underwing and Northern Arches. The Mountain Burnet occurs nowhere else in Britain. Pearl-bordered and Small Pearl-bordered Fritillaries, Scotch Argus, Large Heath and North Brown Argus occur at lower altitudes around these mountains.

### **Deeside**

The valley and its associated tributary system stretches from Braemar in the west to Aberdeen. The central and western sections contain a predominance of semi-natural habitats which support a diverse Lepidopteran fauna. A number of well-known sites are designated SSSI and NNR e.g. Morrone Birkwoods, Muir of Dinnet. This is an important area for Pearl-bordered and Small Pearl-bordered Fritillaries, and Large Heath. Northern Brown Argus, Large Heath and Scotch Argus also occur.

Key moths include Netted Mountain Moth, Small Dark Yellow Underwing and Kentish Glory. The current status of Lunar Yellow Underwing and Narrow-bordered Bee Hawk-moth needs clarification.

### **Central Perthshire & Angus Hills**

This area comprises the hills and valleys around Pitlochry and Dunkeld eastwards to the Angus glens, and is one of the strongholds for Northern Brown Argus and Scotch Argus. Pearl-bordered Fritillary appears reasonably widespread to the west, while Small Pearl-bordered is both common and widespread. There is an outlier population of Mountain Ringlet around Glen Clova. There are populations of Netted Mountain Moth, Sword Grass and Rannoch Brindled Beauty in the area, but the status of Square-spotted Clay, Broad-bordered White Underwing and Large Heath need clarification.

## **Map 2. Important areas for Butterflies and Moths in the Region**

### **Northern, Central & Southern Coastlines**

These three locations could be regarded as one continuous area, but they are interrupted by large conurbations of Aberdeen, Dundee and Edinburgh. In all three the natural habitats may be restricted to a narrow corridor, truncated by extensive farmland or development.

There are extensive areas of coastal dunes at Forvie, St Cyrus, Tentsmuir and, to a lesser extent, the East Lothian coast, which support a wide range of moths species with restricted national distribution.

There are important populations of Small Blue along the northern coastline and coastal plain between Dundee and St Cyrus, and there are also Large Heath sites in the north, albeit 10-20km inland.

The central and southern coasts both support Northern Brown Argus colonies. Small Pearl-bordered Fritillary also occurs, along with Grayling which is virtually restricted to this zone. One of only two current sites for Lunar Yellow Underwing is at Tentsmuir.

### **Central Borders**

The area from the Pentland Hills to the English border is an important location for Northern Brown Argus. Small, restricted colonies of Large Heath, Small Blue and Scotch Argus occur. The current status of the Dark Bordered Beauty, and the Lunar Yellow and Broad-bordered White Underwings needs clarification.

### **South Perthshire**

This area west of Perth extends westwards into the Trossachs part of the South West Scotland Region. It has small populations of Pearl-bordered, plus colonies of Small Pearl-bordered Fritillary and Large Heath, and has most of the Region's records for Purple Hairstreak.

## 7 Survey

### **Butterflies**

A great deal of information on around a dozen scarce day-flying Lepidoptera was collated during 1994-95 by the SDLP (Pearce *et al.* 1996), building on the existing published data sets (Heath *et al.*, 1984; Emmet & Heath 1989, and succeeding volumes).

Substantial progress has been made since then in recording the distribution of butterflies through the 'Butterflies for the New Millennium' project (Asher *et al.*, in press). This has provided dramatically improved coverage across the UK compared to the previous atlas, and allows trends to be determined (see Appendix IV).

Nevertheless, as noted in the species accounts, some colonies of the priority butterflies listed in this plan still remain to be re-located, and that several species are significantly under-recorded. Any developments that will increase the general level of recording, such as the establishment and expansion of Biological Record Centres for the North East, Tayside, the Lothians and the Borders should be encouraged.

### **Moths**

Coverage for moths remains decidedly patchy and still tends to reflect visits to well-known sites. The National Scarce Moth Recording network, co-ordinated by Butterfly Conservation, is currently being expanded and we hope that the result will be significantly increased recording of scarce moths. For more information on the network, contact Dave Green (01929 400209; dgreen@butterfly-conservation.org).

The best-recorded group remains the Burnet moths (*Zygaenidae*), thanks to the work of the Burnet Study Group.

## 8 Monitoring

The most important monitoring of butterflies and moths within our Region is carried out currently within two UK-wide schemes.

### Butterflies

For butterflies, there is a network of transect-monitoring sites forming the Butterfly Monitoring Scheme (BMS). At some sites the data set extends back to the late 1970's, although transect recording has lapsed at a number of sites, notably Glasdrum NNR, and there are currently six operating in the Region (Greatorex-Davies and Pollard, 1997; Greatorex-Davies & Roy, 1999):

- Ben Lawers (NTS)
- Culvie Wood (private)
- Morrone Birkwood (SNH)
- Sands of Forvie (SNH)
- St. Cyrus (SNH)
- Whitlaw Mosses (SNH)

There are also several non-BMS transects using similar methodology in the Region, but data sets are much less complete. These include sites at Glensaugh (Grampian) and Sourhope (Borders), both monitored by the MacAulay Institute as part of the Environmental Change Network.

However, this is an inadequate number of transects to determine national or regional trends. Butterfly Conservation is currently developing software, materials and the infrastructure to encourage and support more transect recording, and to collate data from transects that operate outside the BMS. Data on butterfly monitoring in Scotland are now being collated by Butterfly Conservation, and we are keen to hear of any ongoing butterfly monitoring in the Region (see Appendix VII, Contact Points).

### Moths

For moths, the problems of long-term monitoring are even more acute. As stated above, some valuable monitoring of Burnet moths (*Zygaenidae*) has been carried out by the Burnet Study Group. For the vast majority of non day-flying species, the best monitoring is currently provided by the UK network of light-traps run by the Rothamsted Insect Survey. However, Rothamsted traps are designed to catch only a small representative sample from the local moth fauna. They are not intended to be used for the monitoring rare species.

In recent years, Butterfly Conservation has been running training workshops in conjunction with Kindrogan Field Centre to encourage more surveying and monitoring of moths.

## **9 Land Management**

### **Nature Reserves**

So far there appears to have been relatively little habitat management specifically for butterflies and moths within the Region. This is probably more to do with the relatively large areas of semi-natural habitat remaining, and the apparently relatively healthy state of colonies of some of the key species (compared to England for example), than due to species' requirements not being considered.

Thus some of the nature reserves which have important colonies of key species, for example Ben Lawers, monitor their butterflies even though management has often not been carried out specifically for particular species.

These reserves are rich in many species, and species-specific management would have to be justified in the management plan, whereas often the ideal will be larger-scale habitat management, sensitive enough to cater for a whole range of species. However, where this is the case, species known to be vulnerable to change, or to have very specific requirements, should be monitored to ensure population trends are satisfactory.

### **The Wider Countryside**

However, the majority of sites for key species are in private ownership, principally on farmland or in forestry. Thus an important emphasis will be placed on liaison with and provision of advice through agencies such as FC, SNH, SAC and FWAG. Sometimes, for important colonies of key species, Butterfly Conservation will provide advice direct to landowners and managers.

Advice and information will also be supplied to FE, National Farmers' Union, Scottish Landowners' Federation, Timber Growers Association and conservation organisations such as SWT, RSPB, Woodland Trust and NTS, Ranger Services and LBAP teams, to enable them to advise on the management of sites with key species present or with the potential to colonise. Much of this work will be done by Butterfly Conservation staff.

Two significant new developments are the targeting of the new agri-environmental scheme (the Rural Stewardship Scheme) more towards UK BAP and LBAP habitats and species; and the preparation of a "Butterfly Plan" by Forest Enterprise for their estate. Both provide great potential to influence management in the "wider countryside" for butterflies and moths in general, and to provide the fine-tuning necessary to cater for threatened species.

Currently, the Species Action Plans prepared by Butterfly Conservation through its "Action for Butterflies" project provide the main means of disseminating ecological information (see Appendix VI). Consideration will be given as to how this information can be updated and more accessible, possibly through our website ([www.butterfly-conservation.org](http://www.butterfly-conservation.org)).

## 10 Other activities

The following other activities are also seen as priorities for Butterfly Conservation East of Scotland Branch:

### **Expansion of membership and promotion.**

The current membership is around 150, with an active core of around 15 members. The Branch needs to encourage more people to participate in its work and raise the profile of the plight of Lepidoptera in the Region. Compared to the other two Butterfly Conservation Regions in Scotland, this Region is to some extent less coherent in terms of geography and population.

- Consideration will thus be given to creating and supporting local groups within the Region, for example for the Lothians and Borders, and for Aberdeen and Aberdeenshire.
- The Branch will continue to involve wildlife and natural history groups in, and raise awareness of, its activities.
- The Branch will produce information on its activities tailored to encourage new members to join.
- The Branch will help to promote UK and Scotland-wide Butterfly Conservation campaigns, as well as its own initiatives, through its own newsletter and also through local press releases.
- The Branch will encourage the staging of workshops to aid identification and stimulate butterfly and moth recording.

### **Liaison with local authorities over the production of Local Biodiversity Action Plans.**

All local authorities in the Region are now involved in the LBAP process, and several have Biodiversity Officers.

- The Branch's role with LBAPs should be formalised, and a pro-active approach should be taken to support their work and help implement action plans.

### **Liaison with other countryside agencies, conservation and recording groups**

- The Branch will develop a strategy for contacting and maintaining good working links with key conservation, advisory and record centre staff within the Region.

## 11 Review

The progress on this Action Plan will be reviewed informally at annual intervals by the East of Scotland Branch of Butterfly Conservation. A major review of the plan will be carried out in five years' time.

## 12 References

- Alexander, G., Leaper, G., Francis, I., & Tulloch, M. (1997) Biodiversity in North-east Scotland: A Preliminary Audit of Priority Habitats and Species. North-east Scotland LBAP Steering Group.
- Barbour, D.A. (1986) Expansion of range of the Speckled Wood Butterfly, *Parage aegeria* L., in North-East Scotland. *Entomologists's Record* 98: 98-105.
- Barbour, D. A. (1989) Distribution Survey of the Kentish Glory Moth in Scotland, 17 April - 29 July 1989. Unpublished report to the Scottish Wildlife Trust.
- Barbour, D.A. (1999a) Dark-bordered Beauty moth (*Epione paralellaria*): Review of Sites in Scotland. Unpublished confidential report to SNH.
- Barbour, D.A. (1999b) Narrow-bordered Bee Hawk-moth (*Hemaris tityus*). Unpublished confidential report to SNH.
- Barbour, D.A. & Bland, K.P. (1996) The distribution of the Welsh Clearwing, *Synanthedon scoliaeformis* (Borkhausen, 1789) (*Lepidoptera: Sesiidae*) in Scotland. *Entomologists' Gazette* 48, 93.
- Barbour, D.A. & Kirkland, P. (2000) Regional Action Plan for the Highlands & Western Isles. Butterfly Conservation, Stirling.
- Barbour, D. A. & Young, M. R. (1993) Ecology and conservation of the Kentish Glory Moth (*Endromis versicolora* L.) in eastern Scotland. *Entomologist* 112: 25-33.
- Barnett, L.K. & Warren, M.S. (1995a) Species Action Plan. Pearl-bordered *Fritillary Boloria euphrosyne*. Butterfly Conservation, Wareham.
- Barnett, L.K. & Warren, M.S. (1995b) Species Action Plan. Small Pearl-bordered *Fritillary Boloria selene*. Butterfly Conservation, Wareham.
- Biodiversity Steering Group (1995) Biodiversity: The UK Steering Group Report. Vol. 1. Meeting the Rio Challenge. Vol. 2. Annexes. HMSO, London.
- Bland, K.P. and Young, M.R. (1996). Priorities for conserving Scottish moths. In: Rotheray, G.E. & MacGowan, I. (Ed.s) *Conserving Scottish Insects*. Edinburgh Entomological Club, Edinburgh.
- Bourn, N.A.D. & Warren, M. (1997) Species Action Plan. Large Heath *Coenonympha tullia*. Butterfly Conservation, Wareham.
- Bourn, N.A.D. & Warren, M. (2000) Species Action Plan. Small Blue *Cupido minimus*. Butterfly Conservation, Wareham.
- Bourn, N.A.D., Warren, M. & Kirkland, P. (1996) Action for Butterflies. Butterfly Conservation's Guidelines for producing Regional Action Plans. Butterfly Conservation, Wareham.
- Brereton, T.M. (1999). The distribution, ecology and conservation of the Pearl-bordered *Fritillary* butterfly *Boloria euphrosyne*. SNH Information & Advisory Note.

- Brereton, T.M., Roberts, E.R., & Warren, M.S. (1999). Action for the Pearl-bordered Fritillary, progress 1997-98. Butterfly Conservation, Wareham.
- Brereton, T.M. & Warren, M.S. (1998). Ecology of the Pearl-bordered Fritillary butterfly in Scotland and possible threats from bracken eradication measures in woodland grant schemes. International Bracken Group Symposium.
- DETR (1995) Biodiversity: The UK Steering Group Report. Vols. 1. & 2. HMSO.
- DETR (1999a) UK Biodiversity Group. Tranche 2 Action Plans. Vols. IV & VI. Invertebrates. HMSO.
- DETR (1999b) UK Biodiversity Group. Tranche 2 Action Plans. Vols. VI Terrestrial and Freshwater Species and Habitats. HMSO.
- Eales, H.T. (1999) The current status and prospects in England of the Large Heath Butterfly *Coenonympha tullia* Muller (Lep.: Satyridae) Entomologist's Record 111: 5-9.
- Eales, H.T. & Dennis, R.L.H. (1998) Predicting site occupancy for *Coenonympha tullia* (Muller, 1784) (Lepidoptera: *Nymphalidae*, *Satyriinae*) using habitat parameters. Entomologist's Gazette 49: 3-16.
- Ellis, S. (1998) Survey of sites for the northern brown argus *Aricia artaxerxes* F. in Northern Scotland. Scottish Natural Heritage Research, Survey and Monitoring Report.
- Emmet, A. M. & Heath, J. (1989) The Moths and Butterflies of Great Britain and Ireland. Vol. 7 part 1. *Hesperiidae* to *Nymphalidae*. Harley Books, Colchester.
- Fox, R. & Asher, J. (2000). Butterflies for the New Millennium: Provisional Atlas (1995-1999), Unpublished progress report. Butterfly Conservation, Wareham.
- Greatorex-Davies, J. N. (1980) Recent records of *Agrotis ripae* (Hubner) (*Noctuidae*) and other sand-dune Lepidoptera from Scotland. Entomologist's Gazette 31: 19-22.
- Greatorex-Davies, J. N. & Pollard, E. (1998) The Butterfly Monitoring Scheme : Report to Recorders 1997. Institute of Terrestrial Ecology, Abbots Ripton.
- Greatorex-Davies J.N., & Roy, D.B. (1999). The Butterfly Monitoring Scheme Report to Recorders 1998, ITE.
- Haggett, G.M. & Leverton, R. (1997) Contribution to the early stages of *Xylena exsoleta* L. (Lep.: *Noctuidae*) Entomologist's Record 109: 65-75.
- Heath, J & Emmet A. M. (1979) The Moths and Butterflies of Great Britain and Ireland. Vol. 9. *Sphingidae* - *Noctuidae*, *Noctuinae* and *Hadeninae*. Curwen, London.
- Heath, J, Pollard, E., & Thomas, J. (1984) Atlas of Butterflies in Britain and Ireland. Viking, Harmondsworth.
- Joy, J. & Pullin, A.S. (1997) The effects of flooding on the survival and behaviour of overwintering Large Heath butterfly *Coenonympha tullia* larvae. *Biological Conservation*, **82**, 61-66.

- Kinnear, P. (2000). Butterfly Priority ratings for Scottish Regional Action Plans. Unpublished report to Butterfly Conservation, Edinburgh.
- Kinnear, P. & Kirkland, P. (2000) Regional Action Plan for the Butterflies and Moths of South West Scotland. Butterfly Conservation, Stirling.
- Kirkland, P. (1995). A review of the distribution, ecology and behaviour of the scotch argus. Bulletin XXVI: 2. British Ecological Society, London.
- Leaper, G. (1998) Biodiversity of the Cairngorms Partnership Area: A Preliminary Assessment of Priority Habitats and Species. Cairngorms Partnership, Grantown-on-Spey.
- Leverton, R., Young, M.R. & Barbour, D.A. (1997) *Epione paralellaria* D. & S. (Lep.: Geometridae) and its association with aspen *Populus tremula* in the Scottish Highlands. Entomologist's Record 109: 49-55.
- MacKay, J. (1999a). Pearl-bordered Fritillary, Local Species Action Plan, in: Barnes, A., (Ed.) Dumfries and Galloway LBAP.
- MacKay, J. (1999b). Forester Moth, Local Species Action Plan, in: Barnes, A., (Ed.) Dumfries and Galloway LBAP.
- Mackey, E.C., Shewry, M.C., & Tudor, G. J. (1999). Land Cover Change: Scotland from the 1940s to the 1980s. HMSO, Edinburgh.
- McAllister, D.W. (1993) The spread of the Speckled Wood Butterfly, *Parage aegeria* (Lin.) in Easter Ross and Sutherland. Butterfly Conservation News No.53, Spring 1993, 44-48.
- McAlpine, E. A. M. (1979) The Lepidoptera of the Cairngorms National Nature Reserve. Entomologist's Record 91: 65-70.
- McGowan, G. (1997) The distribution of the Small Mountain Ringlet, *Erebia epiphron mnemon* (Haworth, 1812) in Scotland. Entomologist's Gazette 48: 135-145.
- Pearce, I.S.K., Barbour, D.A., Bayfield, N.G., Young, M.R., Watt, A.D. & Holman, D. (1999). Scottish Diurnal Lepidoptera Project: Sites, Protocols and Distribution. SNH Research & Survey report, No. 113.
- Pullin, A.S., Ed. (1995) Ecology and Conservation of Butterflies. Chapman & Hall, London.
- Ravenscroft, N.O.M. (1997) Ecology of the pearl-bordered fritillary (*Boloria euphrosyne*) in the open woodland of western Scotland. Unpublished report to Butterfly Conservation and SNH.
- Ravenscroft, N.O.M. & Warren, M. (1996a) Species Action Plan. Northern Brown Argus *Aricia artaxerxes*. Butterfly Conservation, Wareham.
- Ravenscroft, N.O.M. & Warren, M. (1996b) Species Action Plan. Small Mountain Ringlet *Erebia epiphron*. Butterfly Conservation, Wareham.
- Shirt, D. B. (Ed.) (1987) British Red Data Books: 2. Insects. Nature Conservancy Council, Peterborough.

- Sivell, D. & Phillips, D.S. (1999) LBAPs – Technical Information on Species, No.3: Invertebrates. SNH.
- Skinner, B. (1984) *Moths of the British Isles*. Viking, Harmondsworth, Middlesex.
- Smout, A-M. & Kinnear, P.K.(1993) *The Butterflies of Fife: A Provisional Atlas*, Fife Council, Glenrothes.
- Stace, C. A. (1997) *New Flora of the British Isles*, 2<sup>nd</sup> edition. CUP, Cambridge.
- Stewart, J.W., Barbour, D.A. & Moran, S.A. (1998) *Highland Butterflies. A provisional Atlas*. Highland Biological Recording Group and The Highland Council, Inverness.
- Swaay, C. van & Warren, M.S. (1999). *Red Data Book of European Butterflies (Rhopalocera)*. Council of Europe publishing, Strasbourg (Nature & Environment Series, No.99).
- Thomson, G. (1980) *The Butterflies of Scotland*. Croom Helm, London.
- Urquhart, U. (1986) *Arctostaphylos* Heathland in N.E. Scotland. Nature Conservancy Council, Peterborough.
- Waring, P. (1992) *Moth Conservation Project. News Bulletin 4*. April 1991 - June 1992. Joint Nature Conservation Committee, Peterborough.
- Waring, P. (1995) *Wildlife Reports: Moths*. British Wildlife 6: 188-189.
- Young, M.R. (1989) *Entomological Survey of Arctostaphylos-rich Heaths*. Unpublished report to Nature Conservancy Council.
- Young, M.R. & Knill-Jones, R.(1987) *The distribution of the Rannoch brindled beauty (Lycia lapponaria scotica Harrison) in Scotland*. Entomologist's Record 99: 7-10.

## Appendix I

### UK BAP Species by Region

#### Butterflies

PRIORITY SPECIES		Highlands & Islands	South West	East
Chequered Skipper	<i>Carterocephalous palaemon</i>	+	+	
Marsh Fritillary	<i>Euphydryas (=Eurodryas) aurinia</i>	+	+	
Northern Brown Argus	<i>Aricia artaxerxes</i>	+	+	+
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>	+	+	+
SPECIES OF CONSERVATION CONCERN				
Large Heath	<i>Coenonympha tullia</i>	+	+	+
Mountain Ringlet	<i>Erebia ephron</i>	+	+	+
Small Blue	<i>Cupido minimus</i>	+	?	+
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	+	+	+

+ present

? possibly extinct

## UK BAP Species by Region

### Moths

PRIORITY SPECIES		Highlands & Islands	South West	East
Argent and Sable	<i>Rheumaptera hastata</i>	+	+	+
Barred Tooth-striped	<i>Trichopteryx polycommata</i>	+	+	+
Cousin German	<i>Paradiarsia sobrina</i>	+	+	+
Dark Bordered Beauty	<i>Epione vesperterea</i> [= <i>parallelaria</i> ]	+		+
Lunar Yellow Underwing	<i>Noctua orbona</i>	+	+	+
Narrow-bordered Bee Hawk	<i>Hemaris tityus</i>	+	+	?
Netted Mountain	<i>Macaria</i> (= <i>Semiothisa carbonaria</i> )	+		+
Northern Dart	<i>Xestia alpicola alpina</i>	+	+	+
Slender Scotch Burnet	<i>Zygaena loti scotica</i>	+	+	
Square-spotted Clay	<i>Xestia rhomboidea</i>	+	+	+
Sword Grass	<i>Xylena exsoleta</i>	+	+	+
SPECIES OF CONSERVATION CONCERN				
Belted Beauty	<i>Lycia zonaria</i>	+	+	
Broad-bordered White Underwing	<i>Anarta melanopa</i>	+		+
Broom Tip	<i>Chesias rufata</i>	+	+	+
Forester	<i>Adscita statices</i>	?	+	
Goat	<i>Cossus cossus</i>	+		
Grey	<i>Hadena caesia mananii</i>	+	+	
Grey Scalloped Bar	<i>Dyscia fagaria</i>	+	+	+
Kentish Glory	<i>Endromis versicolora</i>	+		+
Mountain Burnet	<i>Zygaena exulans</i>			+
Northern Arches	<i>Apamea zeta assimilis</i>	+	+	+
Slender-striped Rufous	<i>Coenocalpe lapidata</i>	+	+	+
Small Dark Yellow Underwing	<i>Anarta cordigera</i>	+		+
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	+	+	+

+ present ? possibly extinct

## Appendix II UK BAP Priority Species in Scotland by Habitat

Much work on implementing the UK BAP will be carried out through the Habitat Action Plans published by DETR. While some species' requirements will be satisfied by implementing general habitat prescriptions, many will require more specific forms of management.

It should be noted that the habitats of several species are poorly understood, particularly in Scotland, and some species are likely to occur in other habitats than those identified. In addition, some important habitats in Scotland were not recognised in the UKBAP, notably birch woodland, aspen stands (outside of "wet woodland") and species-rich bracken stands. These have been included in the table below.

Habitat	Priority BAP species	Association
Aspen stands	Dark Bordered Beauty	P
Birch woodland	Argent and Sable	P
	Cousin German	P
	Square-spotted Clay	P
	Pearl-bordered Fritillary	S
Blanket bog	Argent and Sable	P
	Marsh Fritillary	S
	Narrow-bordered Bee Hawk	S
Bracken (species-rich, south-facing)	Pearl-bordered Fritillary	P
Coastal dunes (includes grassland & heath)	Lunar Yellow Underwing	P
	Northern Brown Argus	S
	Marsh Fritillary	S
Lowland calcareous grassland	Northern Brown Argus	P
Lowland heathland	Argent and Sable	P
	Marsh Fritillary	S
	Narrow-bordered Bee Hawk	S
Lowland raised bog	Argent and Sable	P
	Dark Bordered Beauty	S
Lowland wood pasture and parkland	Pearl-bordered Fritillary	P
Maritime cliff and slope (vegetated cliffs and lichen-dominated cliffs)	New Forest Burnet	P
	Northern Brown Argus	P
	Slender Scotch Burnet	P
Native pine woodland	Cousin German	P
	Argent and Sable	S
	Pearl-bordered Fritillary	S
Purple moor grass and rush pasture	Marsh Fritillary	P
	Chequered Skipper	P
	Narrow-bordered Bee Hawk	P
	Sword-grass	P
	Argent and Sable	P
Upland calcareous grasslands	Northern Brown Argus	P
	Slender Scotch Burnet	S
Upland heathland & moorland	Pearl-bordered Fritillary	P
	Netted Mountain	P
	Northern Dart	P
	Sword-grass	P
	Argent and Sable	S
Upland mixed ash woodland	Barred Tooth-striped	P
	Chequered Skipper	P
	Pearl-bordered Fritillary	P
Upland oakwood	Pearl-bordered Fritillary	P
	Chequered Skipper	P
Wet woodland	Dark-bordered Beauty	P

P = principle habitat; S = secondary habitat

### Appendix III Micro-moths in need of conservation in the East of Scotland Region.

Taken from Bland & Young (1996).

<b>Category X</b>	<b>“Extinct or close to extinction”</b>
<i>Kessleria fasciapennella</i> <i>Catoptria specularis</i>	
<b>Category 1A</b>	<b>“Very restricted distribution, potentially in urgent need of protection”</b>
<i>Callisto coffeela</i> <i>Colephora arctostaphyli</i> <i>Ethmia pyrausta</i> <i>Dichomeris juniperella</i> <i>Eana argentana</i> <i>Pammene leudersiana</i> <i>Ancylis tineana</i> <i>Apotomis infida</i> <i>Stenoptilia islandicus</i>	
<b>Category 1B</b>	<b>“Potentially in need of conservation”</b>
<i>Stigmella betulicola</i> <i>S. dryadella</i> <i>Myrmecozela ochraceella</i> <i>Archinemapoggon yildizae</i> <i>Rhigognostis incarnatella</i> <i>Acrolepiopsis betulella</i> <i>Coleophora genistae</i> <i>C. idaeella</i> <i>Elachista eskoii</i> <i>E. orstadii</i> <i>Depressaria silesiaca</i> <i>Levipalpus hepatariella</i> <i>Exaeretia ciniflonella</i> <i>Cydia cognatana</i> <i>Epinotia crenana</i> <i>Oletheutes metallicana</i> <i>Acleris lipsiana</i> <i>Catoptria permutatella</i> <i>Eudonia alpina</i>	
<b>Category 2A</b>	<b>“Very restricted distribution, in urgent need of protection”</b>
<i>Stigmella spinosissimae</i> <i>Leucoptera orobi</i>	

## Appendix IV      Assigning Regional Priorities

### Methods

The number of 10 km squares recorded for 17 target species (*Chequered Skipper*, *Dingy Skipper*, *Green Hairstreak*, *Purple Hairstreak*, *Small Blue*, *Northern Brown Argus*, *Small Pearl-bordered Fritillary*, *Pearl-bordered Fritillary*, *Dark Green Fritillary*, *Marsh Fritillary*, *Speckled Wood*, *Mountain Ringlet*, *Scotch Argus*, *Grayling*, *Small Heath*, *Large Heath and Ringlet*) were determined for each of the three Scottish Regions from a sub-set of “final provisional” maps for the Butterflies for the New Millennium (BNM) Atlas (January 2000) covering northern Britain, for the period 1995-99 (Kinnear, 2000).

These were compared with the number of 10 km squares determined for the same regions for the period 1970-82, taken from the *Atlas of Butterflies in Britain and Ireland* (Heath, Pollard & Thomas, 1984), to determine apparent change in range. The BNM data were also used to assess rarity and proportion of UK (or Great Britain) population, using the criteria set out in Butterfly Conservation’s *Guidelines for producing Regional Action Plans* (Bourn, Warren & Kirkland, 1996). In addition, the status of several common species was checked using the same criteria.

This method works best if coverage levels and patterns are similar in both data sources. Although this was not exactly the case, we have decided that coverage is good enough to give broad indications of trends, which allow regional priorities to be assigned with a degree of confidence. In fact, as the coverage levels are much better for the BNM, comparisons are likely to under-estimate any declines.

### Under-recorded Species

Several species qualified on rate of decline in some parts of their range, while new discoveries had been made in other areas. There is a consensus among recorders that these apparent changes are most likely due to under-recording, than due to habitat loss. However, efforts should be made to improve the recording of these species, so that any real changes in distribution become clearer.

### Species at the edge of their range

Some species are rare because they are at the edge of their UK range, and are more common further south. From a UK perspective these species do not need resources directed to them.

## Appendix V List of Butterflies of the Region

Resident butterflies recorded during the period 1995-1999 of the Butterflies for the New Millennium project in the East of Scotland, in taxonomic order.

Common Name	Latin Name
Large White	<i>Pieris brassicae</i>
Small White	<i>Pieris rapae</i>
Green-veined White	<i>Pieris napi</i>
Orange-tip	<i>Anthocharis cardamines</i>
Green Hairstreak	<i>Callophrys rubi</i>
Purple Hairstreak	<i>Neozephyrus (Quercusia) quercus</i>
Small Copper	<i>Lycaena phlaeas</i>
Northern Brown Argus	<i>Aricia artaxerxes</i>
Common Blue	<i>Polyommatus icarus</i>
Small Blue	<i>Cupido minimus</i>
Small Tortoiseshell	<i>Aglais urticae</i>
Small Pearl-bordered Fritillary	<i>Boloria selene</i>
Pearl-bordered Fritillary	<i>Boloria euphrosyne</i>
Dark Green Fritillary	<i>Argynnis aglaja</i>
Speckled Wood	<i>Pararge aegeria</i>
Wall	<i>Lasiommata megera</i>
Mountain Ringlet	<i>Erebia epiphron</i>
Scotch Argus	<i>Erebia aethiops</i>
Grayling	<i>Hipparchia semele</i>
Meadow Brown	<i>Maniola jurtina</i>
Ringlet	<i>Aphantopus hyperantus</i>
Small Heath	<i>Coenonympha pamphilus</i>
Large Heath	<i>Coenonympha tullia</i>

## Appendix VI      Butterfly Conservation Action Plans

Plans published for species occurring in Scotland:

<b>Species</b>	<b>Date published</b>
Chequered Skipper	1996
Northern Brown Argus	1996
Small Pearl-bordered Fritillary	1995
Pearl-bordered Fritillary	1995
Marsh Fritillary	1995
Mountain Ringlet	1996
Large Heath	1997
Small Blue	2000
Dingy Skipper	2000

Copies of these plans are available from Butterfly Conservation (Scotland), Balallan House, Allan Park, Stirling, FK8 2QG, price £5 each (includes p&p). They can also be supplied electronically.

## Appendix VII Butterfly Conservation Contact Points & Objectives

### Contact Points for the East of Scotland Branch

Branch Organiser	Richard Buckland	7 Leslie Place, Edinburgh, EH4 1NG.	0131 332 0615	Richard.Buckland@hgu.mrc.ac.uk
Branch Recorder	Chris Stamp	11 Whitefauld Road, Dundee, DD2 1RH.	01382 669288	chrisstamp@enclave4.freereserve.co.uk
Habitats	Eleanor Stafford	11 Whitefauld Road, Dundee, DD2 1RH.	01382 669288	Eleanor@enclave416.freereserve.co.uk
Publicity & Butterfly Monitoring (Scotland)	Pete Kinnear	20 East Queen Street, Newport on Tay, DD6 8AY.	01382 541383	

### Butterfly Conservation's objectives

The British Butterfly Conservation Society (Butterfly Conservation) is the largest insect conservation body in the world and is devoted to the conservation of our native butterflies and moths, and their habitats. Butterfly Conservation:

- takes a leading role in conserving butterflies and moth populations, particularly through the preparation of Species Action Plans
- campaigns to save threatened habitat
- carries out research on threatened butterflies and moths
- is a member of the influential Biodiversity Challenge Groups and Wildlife Links
- acquires and manages nature reserves
- has branches covering the whole of the UK which promote conservation at a local level
- surveys, records and monitors butterflies and moths throughout the UK
- works in partnership with other conservation bodies
- encourages an interest in and awareness of butterflies, moths and their conservation
- advises landowners on habitat management
- promotes invertebrate conservation generally
- publishes *Butterfly Conservation News* three times a year
- lobbies government at all levels to influence planning and policy decisions

Our ultimate goal is the restoration of a balanced countryside, with butterflies and other wildlife returned to the profusion they, and we, once enjoyed.

## **Appendix VIII Abbreviations**

BMS	Butterfly Monitoring Scheme
BNM	Butterflies for the New Millennium
BSG	Burnet Study Group
CEH	Centre for Ecology & Hydrology (formerly the Institute of Terrestrial Ecology)
DETR	Department of the Environment, Transport and the Regions
FC	Forestry Commission
FE	Forest Enterprise
JNCC	Joint Nature Committee for Conservation
LBAP	Local Biodiversity Action Plan
LA	Local Authorities
NTS	National Trust for Scotland
NNR	National Nature Reserve
RDB	Red Data Book: Insects
RSPB	Royal Society for the Protection of Birds
SAC	Scottish Agricultural College
SDLP	Scottish Diurnal Lepidoptera Project
SERAD	Scottish Executive, Rural Affairs Department
SNH	Scottish Natural Heritage
SWT	Scottish Wildlife Trust