



REGIONAL ACTION PLAN FOR THE BUTTERFLIES AND MOTHS OF THE HIGHLANDS AND WESTERN ISLES

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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 on the distribution, status and ecology of high and medium priority butterflies and moths in the Highlands and Western Isles, 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 Highlands. 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-moths¹ for the Highlands and Western Isles are:

BUTTERFLIES	
Chequered Skipper	<i>Carterocephalus palaemon</i>
Dingy Skipper	<i>Erynnis tages</i>
Large Heath	<i>Coenonympha tullia</i>
Marsh Fritillary	<i>Euphydryas (=Eurodryas) aurinia</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>
MOTHS	
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	<i>Hemaris tityus</i>
Netted Mountain	<i>Macaria (=Semiothisa) carbonaria</i>
Northern Dart	<i>Xestia alpicola alpina</i>
Slender Scotch Burnet	<i>Zygaena loti</i>
Square-spotted Clay	<i>Xestia rhomboidea</i>
Sword Grass	<i>Xylena exsoleta</i>

¹ “Micro-moths” have been omitted (see Section 3.3)

The main priorities for action 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 Highlands 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 the World Wide Fund for Nature, Scottish Natural Heritage (SNH), 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 Highlands Branch, that is, the local authority areas for Highland, Moray, and the Western Isles. The Orkney and Shetland Isles are not included in this plan.

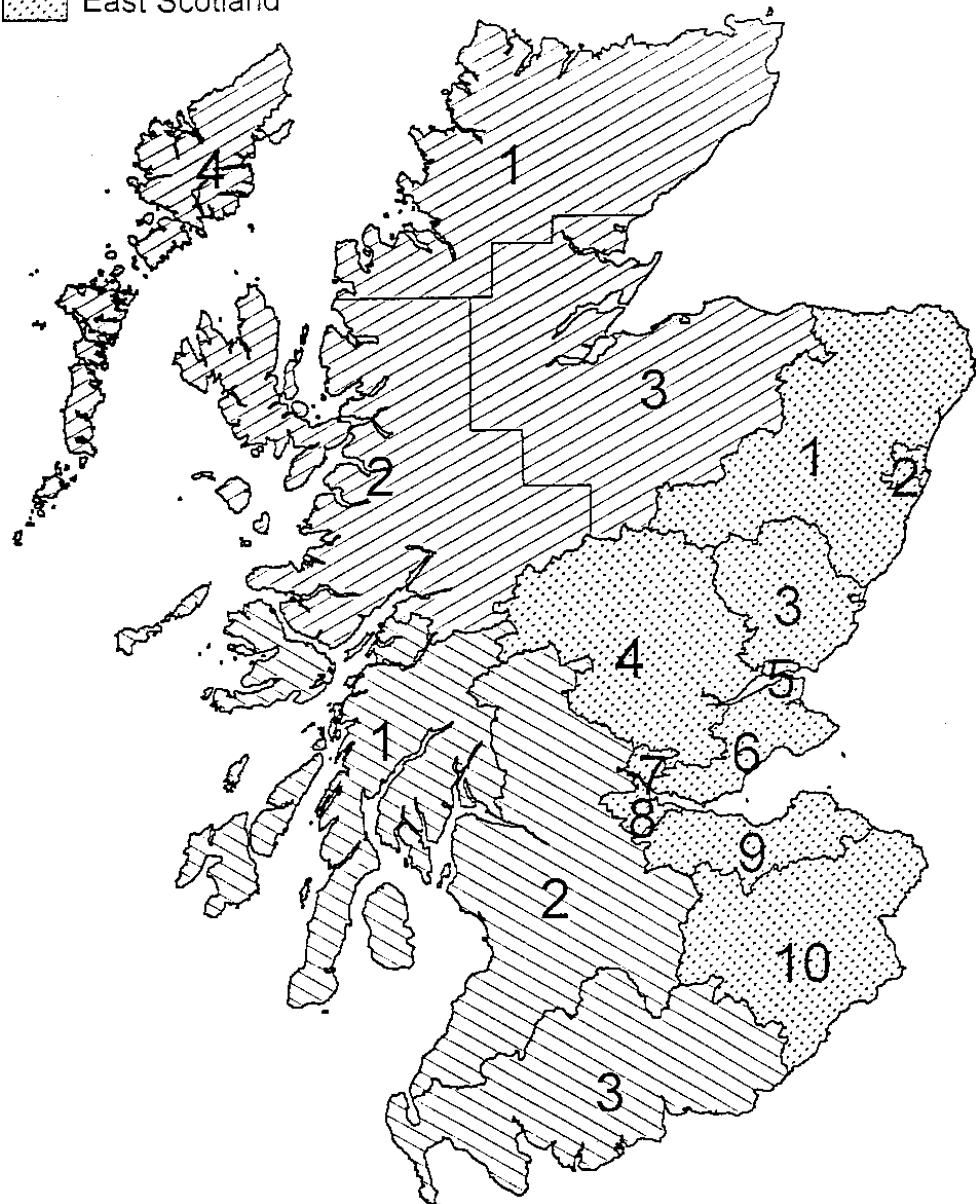
Features of the Highlands and Western Isles

The Region covers around 3 million hectares, approximately 40% of the land area of Scotland. Much of the Region is heather moorland, grassland and mire, with areas of arable and woodland especially towards the eastern coastline and occupying larger parts of Moray.

Vast areas of semi-natural habitat still remain, although since the 1940's heather moorland and mire have declined, with increases in arable and built land. On the mainland there have been substantial losses of heather moorland, mire, broad-leaved woodland and hedgerows, and significant increases in conifer plantations, semi-improved and rough grassland, reservoirs, built land, bracken and arable. The Western Isles have seen declines in blanket mire and an increase in improved pasture (Mackey *et al.*, 1999).

Butterfly Conservation Regions

-  Highlands and Western Isles
-  South and West Scotland
-  East Scotland



Map 1

Limits of the Highlands and Western Isles Region for the purposes of this plan, and the division into four sub-regions:

- 1 North;
- 2 West;
- 3 East; and the
- 4 Western Isles.

These divisions also reflect biogeographical differences, and to some extent the spheres of activity of local recording groups.

Butterfly Conservation in the Highlands

It should be emphasised at the outset that the Region dealt with in this plan is unique among the 14 UK regions which will be producing equivalent plans. The area involved comprises just over one-eighth of the UK's land area. The resident population is around one three-hundredth of the UK population. This means that the average population per unit area is one-fortieth of the UK's overall average. Furthermore this population is largely concentrated in one or two large towns on the edge of the Region, so that much of the countryside is sparsely populated.

Set alongside this is the fact that northern Scotland has a large proportion of the nation's truly wild and least man-managed countryside, and a correspondingly very large endowment of special habitats and species of conservation importance. This is true for butterflies and moths as much as for more conspicuous wildlife.

The Highlands Branch has been active since 1995, and has a small and very geographically-dispersed membership. The Branch looks forward to a period of expanding activity in furthering the enjoyment and conservation of Lepidoptera in the Region. However, it has to be said that 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 may seem modest.

Thus it will be more than ever necessary to seek co-operation and partnership with other bodies and individuals in the conservation movement. We are certainly fortunate that the very special environment of the Highlands has inspired and attracted naturalists and conservationists of all sorts, and it will be a particular aspect of our challenge to 'bring them on board' to help in our specific aim of Lepidoptera conservation.

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

- private landowners and their respective organisations, the National Farmer's Union of Scotland (NFUS) and the Scottish Landowners' Federation (SLF);
- 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;
- and those with a remit for providing advice on nature conservation, such as the Scottish Agricultural College (SAC) and the Farming and Wildlife Advisory Groups (FWAG).

2 Sources of Information

The information used in the compilation of this Plan has come partly from sources within Butterfly Conservation's Highlands Branch, but also very largely from national distribution and conservation schemes.

A useful starting point was the *Scottish Diurnal Lepidoptera Project* (SDLP) which operated with SNH funding in 1994-95 (Pearce *et al.*, 1996). This was a scheme to collate distribution data for 15 key species of butterflies and day-flying moths, and to establish baselines for monitoring their populations at selected sites.

For butterflies, we have been able to draw on two (partially overlapping) sources: the data assembled for the provisional atlas 'Highland Butterflies' (Stewart *et al.*, 1998) and the data-base of 'Butterflies for the New Millennium' (BNM) comprising records for the 1995-99 recording period exclusively (Fox & Asher, 2000). The Highland Butterflies atlas was compiled with data held in the Highland Biological Recording Group's data-base at Inverness Museum. Special thanks for maintaining this are owed to Jimmy Stewart and Stephen Moran. The BNM data, still being finalised at the time of writing, are held by David Barbour as local co-ordinator and additional records (Section 4) were taken from the set of UK progress maps issued in January 2000 (Kinnear, 2000).

For information on the representation of butterflies in transects of the Butterfly Monitoring Scheme (BMS), organised by the Centre for Hydrology (CEH, formerly the Institute of Terrestrial Ecology), we have referred to the annual summary reports of the Scheme, particularly the 1997 report (Greatorex-Davies & Pollard, 1998) which summarised the occurrence of species on all of the then current transects.

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) have therefore been drawn largely from the interim maps (Waring, 1992), but for key species information has been updated with reference to the species action plans compiled by the government (DETR, 1995, 1999a & 1999b).

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).

3 Assigning Regional Priorities

3.1 Butterflies

Regional priorities were determined using criteria proposed in Butterfly Conservation's *Guidelines for producing Regional Action Plans* (Bourn *et al.*, 1996). These criteria are used to enhance 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 more detailed discussion on how regional priorities were derived, see Appendix IV).

UK BAP Rating

Four species recorded in the Region are termed "UK Priority Species":

Chequered Skipper	<i>Carterocephalus palaemon</i>
Marsh Fritillary	<i>Euphydryas aurinia</i>
Northern Brown Argus	<i>Arícia 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" have been recorded:

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 which have declined by >32% over 25 years in the number of 10 km squares occupied in the Region.

The following species has had its rating enhanced due to its recent rate of decline:

Dingy Skipper	<i>Erynnis tages</i>
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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 have had their rating enhanced due to their rarity:

Dingy Skipper	<i>Erynnis tages</i>
Small Blue	<i>Cupido minimus</i>

Proportion of the UK Resource

Species for which the Region holds 20% or more of the total UK population. The following species have had their rating enhanced due to the proportion of the UK resource in the Region:

Scotch Argus	<i>Erebia aethiops</i>
Mountain Ringlet	<i>Erebia ephiphron</i>
Large Heath	<i>Coenonympha tullia</i>

Summary

Thus the following species have had their priority rating enhanced for the Highlands & Western Isles Region:

Species	UK Rating	Regional Rating
Dingy Skipper	Low	High
Large Heath	Medium	High
Mountain Ringlet	Medium	High
Small Blue	Medium	High
Scotch Argus	Low	Medium

Under-recorded Species

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

Grayling	<i>Hipparchia semele</i>
Green Hairstreak	<i>Callophrys rubi</i>
Dark-green Fritillary	<i>Argynnis aglaja</i>
Large Heath	<i>Coenonympha tullia</i>
Small Copper	<i>Lycaena phlaeas</i>
Small Heath	<i>Coenonympha pamphilus</i>
Speckled Wood	<i>Pararge aegeria</i>

Species at the edge of their range

The Ringlet (*Aphantopus hyperantus*) is rare in the Region, because it is at the edge of its UK range. As it is much more common further south, from a UK perspective this species does not need resources directed at it.

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

3.2 Key Butterflies of the Highlands and the Western Isles

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
Dingy Skipper	<i>Erynnis tages</i>	Rapid recent decline Rare
Chequered Skipper	<i>Carterocephalus palaemon</i>	UK Priority Species
Large Heath	<i>Coenonympha tullia</i>	UK Species of Conservation Concern Large proportion of UK population
Marsh Fritillary	<i>Euphydryas aurinia</i>	UK Priority Species
Mountain Ringlet	<i>Erebia epiphron</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
Medium Priority		
Scotch Argus	<i>Erebia aethiops</i>	Large proportion of UK population
Small Pearl-bordered Fritillary	<i>Boloria selene</i>	UK Species of Conservation Concern

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.

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 their 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 for all moths would be determined using the criteria in the Regional Action Plan guidelines, as has been done for the butterflies i.e. using regional rates of decline, rarity, and proportion of the UK resource, but the data are in most cases not good enough. We would hope that the priority list could be revised in the light of additional recording over the next few years.

3.4 Key Macro-Moths of the Highlands & Western Isles

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 vesperterea</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	<i>Macaria carbonaria</i>	UK Priority Species
Northern Dart	<i>Xestia alpicola alpina</i>	UK Priority Species
Slender Scotch Burnet	<i>Zygaena loti scotica</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		
Belted Beauty	<i>Lycia zonaria</i>	UK Species of Conservation Concern
Broad-bordered White Underwing	<i>Anarta melanopa</i>	UK Species of Conservation Concern
Broom Tip	<i>Chesias rufata</i>	UK Species of Conservation Concern
Forester	<i>Adscita statices</i>	UK Species of Conservation Concern
Goat	<i>Cossus cossus</i>	UK Species of Conservation Concern
Grey	<i>Hadena caesia mananii</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>	Rare (RDB3)
Rannoch Sprawler	<i>Brachionycha nubeculosa</i>	UK Species of Conservation Concern
Slender-striped Rufous	<i>Coenocalpe lapidata</i>	UK Species of Conservation Concern
Slender Scotch Burnet	<i>Zygaena loti</i>	UK Species of Conservation Concern
Transparent Burnet	<i>Zygaena purpuralis</i>	Declining
Welsh Clearwing	<i>Synanthedon scoliaeformis</i>	UK Species of Conservation Concern

N.B. The critically endangered New Forest Burnet (*Zygaena viciae*) occurs in western Scotland, but has a separate action plan and thus it is not considered further here.

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 (and date of action plan, priority species only), or the Red Data Book, and any legal protection.

Species identified in the UK Steering Group Report on Biodiversity (DETR, 1995), as “Short” or “Middle List” species are now termed “Priority Species”, and all now have published action plans (or “statements”). Those given as “Long List” species are now termed “UK Species of Conservation Concern”.

Distribution

Distribution is summarised under four sub-regions:

North: Caithness, Sutherland and Wester Ross
East: Nairn, Moray, Easter Ross and East Inverness
West: Wester Ross, Skye, Lochalsh and Lochaber
Western Isles: Western Isles

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 colonies, particularly by the UK Butterfly Monitoring Scheme (see Section 8).

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 most organisations have limited resources, and will not necessarily be able to commit themselves to many of these. 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

Chequered Skipper (*Carterocephalus palaemon*)

Ecology

Primarily a species of woodland edge or open woodlands which are usually subject to light grazing. The adults nectar in drier areas on bugle (*Ajuga reptans*) and bluebell (*Hyacinthoides non-scripta*), whilst the larvae require wetter areas supporting their food plant, purple moor-grass (*Molinia caerulea*). For detailed information on ecology and management, see Ravenscroft & Warren (1996a).

Status

A UK Priority Species (DETR, 1995). Protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

The first Scottish records of the Chequered Skipper were from near Fort William (Mackworth-Praed, 1942), and it was subsequently found in West Inverness-shire as far south as Loch Etive (Collier 1986). Surveys were carried out for the Scottish Wildlife Trust (SWT) in the 1970's (Moffat, 1975; Houston, 1976), and for SNH in 1993 (Ravenscroft, 1994). The Chequered Skipper has been recorded from some 50 sites in Scotland, covering 30 10 km squares, although it thought that its continued survival may depend on just 10-12 core colonies. The butterfly became extinct in England in around 1975.

West Recently confirmed in 17 10km squares (and three others just outside our Region). Some remote colonies have not been checked for several years.

North, East & Western Isles Never recorded

Threats

Under-grazing or removal of grazing, allowing the scrubbing over of open woodland sites.
Over-grazing.
Lack of woodland management, leading to loss of open glades and rides.

Site Safeguard & Management

Positive management of forestry plantations and powerline wayleaves is required to maintain several colonies. The Chequered Skipper occurs at Ariundle NNR and Doire Donn (SWT).

Advisory

Butterfly Conservation has compiled a list of owners of all sites and there is on-going consultation with the Forestry Commission (FC) and SNH. A booklet with detailed information on ecology and management has been produced by Butterfly Conservation (Ravenscroft, 1996a), with funding from SNH and Scottish Hydro.

Research & Survey

Butterfly Conservation has produced a comprehensive site inventory, identifying ten core areas, all but one of which occurs in this Region. Detailed surveys have been carried out in recent years (Ravenscroft 1994, 1995, 1996b). Core sites were re-surveyed in 1999 by SNH.

Monitoring

Recorded on the BMS transect at Ariundle NNR and on the SWT transect at Doire Donn.

Action	BC's Targets	Possible Partners
Protect core sites from damage or inappropriate management	2001	SNH, FC, LA, SERAD, owners
Ensure land management advisers have adequate guidance	2001	FC, SNH
Provide owners of all core sites with management guidelines	2001	SAC, SNH, SWT
Survey all historical, extant and potential sites	2005	LBAP, SNH
Review existing transects, and establish additional transects if necessary	2001	FE, SNH, SWT

Dingy Skipper (*Erynnis tages*)

Ecology

A species of lightly-grazed, usually moderately base-rich and well-drained grasslands, often occurring in small, discrete colonies. It is also sometimes found on damper grasslands. The larval food plants include both common and greater bird's-foot-trefoil (*Lotus corniculatus* and *L. uliginosus* respectively). For detailed information on ecology and management, see Bourn, *et al.* (2000).

Status

Not listed in the UK BAP, but rare and declining in the Region.

Distribution

Very restricted, occurring in a small number of coastal sites on the Moray Firth and in two or three inland areas. Though the overall number of 10km squares is little changed since the 1980's (Heath *et al.*, 1984). However this seems to be due to the discovery of new colonies through better recording, matching known losses. Significant recent declines have been recorded in other parts of the UK.

East The majority of colonies, including three or four quite large and long-persisting ones, are on coastal sand dunes or shingle along the south shore of the Moray Firth. Inland it is known from Glen Strathfarrar (1984 and 97), Scootmore Forest (1974), and the Aviemore/Boat-of-Garten area.

North,

West & Never recorded

Western Isles

Threats

Successional change, for example on disused railway lines, or through lack of grazing. Afforestation, or canopy closure in woodlands through lack of management. Coastal erosion (very locally).

Site Safeguard & Management

Warm, sheltered sites with some bare ground for basking seems to be a prerequisite. Maintenance of short swards where its food plant can flourish.

Survey

No systematic survey has been attempted. Checks on some former sites were made for the SDLP in 1995, which mostly produced negative results.

Monitoring

Recorded on BMS transects occasionally at Loch Garten. Also recorded by SWT at the Lein of Garmouth.

Actions	BC's Targets	Possible Partners
Identify and protect core sites	2002	LBAPs, owners
Provide guidance to land management advisers	2002	LBAPs
Provide owners of all core sites with management guidelines	2002	FWAG, SAC, SWT
Survey all known and potential sites	2002	LBAPs
Ensure adequate transect monitoring	2002	SNH, SWT, RSPB

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 in tussocks. It has declined in the south and east of its range in the UK through the loss of lowland peat bogs. For information on ecology and management see Bourn & Warren (1997).

Status

A UK Species of Conservation Concern. The Region probably holds more than 20% of the UK population. 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). Protected under Schedule 5 of the Wildlife and Countryside Act with respect to sale only.

Distribution

Very widely distributed in all mainland areas and all the larger Islands. Absent only in lowland, more agricultural areas. Apparent declines are probably due to under-recording.

North Widespread and common, and one of the most widely-recorded species.

West Widespread and locally common, including Skye. Formerly common on the Small Isles, but no confirmation of the latter since 1970.

East Widespread and locally common, at least in higher parts.

Western Isles Widespread but under-recorded in the recent period.

Threats

Habitat loss through peat extraction (primarily lowland mosses). Small-scale "traditional" peat-cutting is not likely to be a problem for this species.

Drainage, for either agricultural improvement or forestry. Overgrazing.

Site safeguard & Management

No examples of management for this species currently known in the Region.

Monitoring

Recorded on BMS transects at Pollymore, Glen Strathfarrar, and Loch Garten. Also recorded on the SWT reserve at Doire Donn.

Action

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

Action	BC's Targets	Potential Partners
Provide guidance to land management advisers	2002	SNH, FC
Continue monitoring established sites	annually	RSPB, SNH, SWT

Marsh Fritillary (*Euphydryas* [=*Eurodryas*] *aurinia*)

Ecology

This is a species of unimproved, lightly-grazed, species-rich acid grassland, with abundant devil's-bit scabious (*Succisa pratensis*), the larval foodplant. For detailed information on ecology and management see Barnett & Warren (1995a).

Status

A UK Priority Species in the UK BAP, (DETR, 1995). Fully protected under Schedule 5 of the Wildlife and Countryside Act. Listed on Annex II of the EC Habitats Directive, and Appendix II of the Bern Convention, and threatened in Europe (Swaay & Warren, 1999).

Distribution

The Region lies just outside the core area of the Marsh Fritillary in Scotland (Argyll and Inner Isles). There are only a small number of colonies in the Region, of uncertain status.

West Two or three sites only, little known and not confirmed since 1980s.
East Not certainly recorded since nineteenth century
North & Never recorded
Western Isles

Threats

Agricultural improvement and drainage. Overgrazing.
Cessation of grazing, and resultant loss of foodplant. Afforestation

Site Safeguard & Management

Sites require grazing at low stocking rates, preferably by cattle rather than sheep. Open, sunny sites with some shelter are most favoured.

Advisory

SNH has produced an advice note. Management for this species is also likely to benefit the Narrow Bordered Bee Hawk-moth (see below).

Research & Survey

This species has been the subject of intensive surveys by SNH and Butterfly Conservation in Argyll.

Action	BC's Targets	Potential Partners
Survey all sites with no post- 1995 records	2001	LBAP, SNH
Identify and protect core sites from damage or inappropriate management	2001	FC, SERAD, SNH owners
Provide guidance to land management advisers and owners	2001	SAC, SNH

Mountain Ringlet (*Erebia ephron*)

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 (1996c), although a great deal remains to be discovered.

Status

A UK Species of Conservation Concern. The Region probably holds more than 20% of the UK population. 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 converge.

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.

East Three or four sites, all but one little known and not recently confirmed.
West It is difficult to assess the true current position. Heath, Pollard & Thomas (1984) showed only three 10 km squares. However McGowan (1997) summarising her own observations and all others available, mapped ten 10 km squares in this part of the Region for 1983-95. This is probably the truest indication, since many of these remote sites have not been re-checked in the last decade.

*North &
Western Isles* Never recorded

Threats

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

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 (formerly ITE) into habitat preferences. Butterfly Conservation encouraged recording in 1999, using returnable postcards.

Monitoring

Monitored at Creag Meagaidh NNR, recently incorporated into the BMS (Greatorex-Davies, pers. comm.). Adverse weather during the flight season and the remoteness of most sites means that monitoring of adults is particularly difficult.

Action	BC's Targets	Possible Partners
Identify and protect core sites	2004	LBAP, owners
Provide owners of all core sites with management guidelines	2004	FWAG, SAC, SWT
Survey all sites with 20 th C. records	2004	CEH, LBAPs
Encourage research on habitat requirements	2004	CEH
Continue monitoring at Creag Meagaidh	Annually	SNH

Northern Brown Argus (*Aricia artaxerxes*)

Ecology

This species 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 (1996b).

Status

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

Distribution

Highly localised in small discrete colonies, due primarily to the distribution of its foodplant. The Northern Brown Argus has been subject to intensive recent survey which has increased the number of known sites, and it is currently recorded from more than 20 colonies in 16 10 km squares.

<i>North</i>	One colony only known, near Rogart. (A record from N.W. Sutherland mapped in Emmet & Heath (1989) is believed to be an error).
<i>East</i>	Occurs in two distinct areas: the coastal cliffs of Easter Ross (six colonies) and inland grasslands in the Speyside, Tomintoul and Cabrach areas (> 12 colonies). Between these two areas the foodplant is largely absent.
<i>West & Western Isles</i>	Never recorded (foodplant absent).

Threats

Overgrazing, more rarely undergrazing.
Habitat loss. Afforestation

Site Safeguard & Management

Management prescriptions are outlined by Ellis (1998) who studied six sites in Scotland. 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.*, 1996) searched many common rock-rose sites, looking for the adult or its eggs. A high proportion of searches were successful, resulting in the now much-improved knowledge of its distribution.

Monitoring

Not recorded in any of the BMS transects in our Region. Monitoring by egg-counts is practical for this species.

Action	BC's Targets	Possible Partners
Identify core sites	2003	LBAP, SNH
Protect core sites from damage or inappropriate management	2003	SNH, FC, LA, owners
Provide guidance to land management advisers	2003	LBAPs, SNH
Provide owners of all core sites with management guidelines	2003	FWAG, SAC, SNH, SWT
Survey all sites with no post-1995 records	2003	LBAPs, SNH
Establish monitoring on at least two core sites	2003	LBAP, NTS, RSPB, 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 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 (1995b).

Status

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

Distribution

Intensive surveys by Butterfly Conservation (Brereton *et al.*, 1999) have confirmed this species' wide distribution over the mainland part of the Region, being absent only from the far north. Its particular strongholds are the upland glens of the central and west Highlands. It is doubtful if it occurs on any of the Islands.

<i>North</i>	Very restricted, with only four to five colonies known, all within Wester Ross.
<i>West</i>	Widespread, many new colonies found recently and probably still under-recorded.
<i>East</i>	Widespread, several new colonies found recently and probably still somewhat under-recorded. It occurs up to 600m in the Cairngorms (McAlpine, 1979), where its habitat is markedly more exposed than the norm.
<i>Western Isles</i>	Never recorded

Threats

Scrubbing over of woodland glades e.g. in woodland regeneration programmes where grazers are excluded. Afforestation of grassland/bracken habitats.

Overgrazing in open woodland, or woodland edge habitats, especially by sheep.

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, and maintenance of light to moderate bracken cover (Brereton & Warren 1998). Plantation management should ensure the removal of brash following felling operations from south-facing sites to encourage violets (MacKay, 1999a).

Prescriptions with special reference to the west Highlands were researched in 1997-98 (Ravenscroft 1997a, Brereton & Warren 1998). 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

Bracken management for the benefit of Pearl-bordered Fritillary has been initiated at the RSPB Glenborrodale Reserve.

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.

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. Information on habitat was also collected by the SDLP at Loch Arkaig.

Monitoring

Recorded on BMS transect at Strathfarrar, and occasionally at Pollymore and Loch Garten. Also recorded on the SWT reserve at Doire Donn.

Action	BC's Targets	Potential Partners
Identify core sites	2001	LBAPs
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
Continue monitoring on established sites	Annually	FE, RSPB, SNH, SWT

Small Blue (*Cupido minimus*)

Ecology

The UK's smallest butterfly, it is a species of sheltered, 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

The Small Blue's distribution coincides strongly with that of Dingy Skipper (see above), but is somewhat more widespread. Besides its main stronghold around the coast of the Moray Firth, it occurs on the far north coast (three colonies), and inland at Boat of Garten and at a few other sites. The coastal colonies seems to be stable, but there is evidence that the inland colonies are vulnerable to successional change.

North Three isolated colonies on coastal sands/shingles. The most remote, at Bettyhill, not confirmed since 1994.

East Around 20 colonies known from sand-dune and shingle sites on both sides of the Moray Firth. Several of these are of large size and of long-known persistence. Inland much more localised, as is its foodplant, kidney vetch. These inland sites are often on abandoned railway tracks or river shingles, both of which are by nature quite impermanent. However it has persisted in the Grantown/Boat-of-Garten area since at least 1895.

West &

Western Isles No confirmed records.

Threats

Habitat loss through development.

Succession, i.e. scrubbing over of old railway tracks

Coastal erosion, recreational pressure.

Site Safeguard & Management

The Small Blue requires a sward of varied height, to provide perching and roosting sites, as well as open, sunny but sheltered areas for basking. Some bare ground is probably needed to allow the germination of kidney vetch seedlings. On some Scottish sites, rabbit grazing appears to provide a satisfactory habitat, however high rabbit numbers can decimate Small Blue colonies by feeding on the flowers of kidney vetch in which the eggs are laid, and the larvae develop.

Survey

A survey of coastal sites in Banffshire was made for the SDLP in 1995 by Roy Leverton and R. Smith. About half of this coastline lies outside our Region to the east, but some 16 colonies were recorded in all, of which nine fall within the Region. Other coastal sites have been surveyed less systematically by David Barbour and others.

Monitoring

Recorded on SWT reserves at the Lein of Garmouth and Loch Fleet. The Small Blue can be monitored by counting eggs.

Actions	BC's Targets	Possible Partners
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 sites	2002	LBAPs
Review current monitoring, and ensure adequate transect occurs	2002	LBAP, SWT, RSPB

4.3 Medium Priority Species

Scotch Argus (*Erebia aethiops*)

Ecology

A species of sheltered, lightly-grazed damp grasslands, woodland edges and plantations from sea-level to at least 500m altitude. 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 in Cumbria (Kirkland, 1995).

Status

Not listed in the UK BAP. The Region probably holds more than 20% of the UK population.

Distribution

Widespread and common (numerically one of our most abundant butterflies). Absent only from extreme North-east, the Small Isles and the Western Isles (although a recent record has been received for Maol Domhnaich off Barra).

<i>North</i>	Regularly reported only from a small area of Wester Ross. Elsewhere in the North clearly at the edge of its range, only occasional sightings.
<i>West</i>	Widespread and common, including Isle of Skye.
<i>East</i>	Widespread and very common, except southeast Sutherland and the Tain peninsula.
<i>Western Isles</i>	No records until 1998.

Threats

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

Survey

No systematic survey has been made

Site Safeguard & Management

Most sites are ungrazed or only very lightly-grazed.

Monitoring

Recorded on BMS transects at Glen Strathfarrar, Ariundle, Insh Marshes and Loch Garten.

Action	BC's Targets	Possible Partners
Check status in marginal areas of the distribution	2005	LBAPs
Provide guidance to land management advisers	2005	LBAPs
Continue monitoring on established sites	Annually	RSPB, SNH

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 (1995c).

Status

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

Distribution

Widespread and locally common. Absent only from Western Isles.

<i>North</i>	Quite common in north-west, but only very locally distributed in North Sutherland and Caithness.
<i>West</i>	Widespread and common.
<i>East</i>	Widespread and locally common.
<i>Western Isles</i>	Never recorded.

Threats

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

Site Safeguard & Management

Maintenance of open rides and clearings within plantations. Maintenance of light cattle grazing in damp grassland, flushes and open moorland sites.

Survey

During the recent Pearl-bordered Fritillary surveys by Butterfly Conservation, several new records were made of this species, since the two often co-exist.

Monitoring

Recorded on BMS transects at Polymore, Ariundle, Glen Strathfarrar, Insh Marshes and Loch Garten. Also on SWT reserves at Doire Donn, Rahoy Hills, Isle of Eigg, Loch Fleet and Lein of Garmouth.

Action	BC's Targets	Possible Partners
Provide guidance to land management advisers	2005	LBAPs
Continue monitoring established sites	Annually	RSPB, SNH, SWT

5 Species Accounts: Macro-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 moths (*Zygaenidae*), being tackled by the Burnet Study Group (see below), few moth species are currently being targeted for active conservation measures in the Region.

Thus in several cases, the only specific actions 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 and information on distribution. This particularly applies to the “micro-moths”.

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 predominant subspecies in this Region is *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), due to loss of colonies to the south of the Highlands.

Distribution

The subspecies *nigrescens* is widespread and locally common throughout the western part of the Highlands. 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.

Threats

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

Action	BC's Targets	Potential Partners
Provide guidance to land management advisers	2005	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 from Ardnamurchan, Inverness-shire, Thornhill (Dumfries) Kirkcudbright, Arran and Canna, but no recent confirmed records in the Region.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	SNH
Encourage research on habitat and management requirements	2004	FC, SNH

Cousin German (*Paradiarsia sobrina*)

Ecology

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

Status

A UK Priority Species (DETR, 1999a).

Distribution

East The distribution follows the extent of native woodland areas in the eastern valleys.

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, this moth seems to favour extensive open areas of young regenerating birch, although it can occur in more mature woods. Any management which aims to favour these species should aim to keep significant areas of habitat in this essentially transitional stage (perhaps by coppicing the young birch at intervals of a few years).

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

Dark Bordered Beauty (*Epione vespartaria* [= *paraellaria*])

Ecology

In the region 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 on the Borders site, which has no aspen, the moth larvae feed on creeping willow (*Salix repens*), as they do on the English sites.

Status

A UK Priority Species (DETR, 1999a).

Distribution

The Dark-bordered Beauty is known from only five sites in the UK since 1980. Three of these are in Scotland, of which just two (one on Speyside, the other on Deeside) have current records. The third site is in the Borders.

East The species is confined to one confidential site in the Region, a birch-aspen wood near Grantown-on-Spey, where it was re-discovered in 1996 after an interval of 43 years (Leverton *et al.*, 1997). It may be more widespread, but the only other record in the Region, a light-trapped individual at Aviemore in 1975, has not been repeated.

Threats

Grazing levels are critical to the survival of aspen suckers. The species may have survived in its one site because it is a large woodland complex, where grazing pressures appear to have never been so uniformly high as to eliminate aspen suckers over the whole area.

Site Safeguard & 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.

A project began in 2000 in conjunction with 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.

Action	BC's Targets	Potential Partners
Undertake survey of potential sites	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. There are about ten locations of old records very widely scattered in the Region. The Findhorn area on the Moray Firth was once a well-known collector's location, but there does not seem to be any recent confirmation of its survival there. The only recent record in north Scotland was just outside our Region at Cornhill in 1995.

Action	BC's Targets	Potential Partners
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 peat bogs, moorland and occasionally woodland. The larval food plant is devil's-bit scabious (*Succisa pratensis*).

Status

A UK Priority Species (DETR, 1999a).

Distribution

Formerly widespread in Britain, but is reported to have declined in recent years. Few Scottish records were reported since 1980, however, since about 1995 there has been a considerable upsurge in reported sightings, and in this Region alone there are about ten localities with recent records (Barbour, 1999b).

Threats

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

Site Safeguard & Management

Although the exact requirements are not known, light grazing is assumed to be the preferred management. This is likely to be the preferred option on sites holding this species and Marsh Fritillary (which is known to co-exist with the moth in several western sites just outside this Region).

Action	BC's Targets	Potential Partners
Identify and protect core sites	2001	FC, SERAD, SNH, owners
Provide guidance to land management advisers	2001	SERAD, SNH
Provide owners of all core sites with management guidelines	2001	FWAG, SAC, SERAD, SNH
Survey all known and potential sites	2001	SNH
Encourage research on habitat requirements	2001	SNH
Establish monitoring on at least two core sites	2001	LBAP, SNH

Netted Mountain (*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. Less commonly, the moth 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). Most known colonies are in the Newtonmore area, although there is a record from Easter Ross.

Threats

The *Arctostaphylos/Calluna* heath habitat occurs at moderate-to-intermediate altitudes on well-drained ground, and as such it has been reduced by afforestation 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 heathland management, which tends to favour ling at the expense of bearberry. Moderate grazing is unlikely to be harmful.

Action	BC's Targets	Potential Partners
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	SNH
Encourage research on habitat requirements	2003	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

Recent occurrences in traps of the Rothamsted Insect Survey in Lewis and Harris seem to be the first evidence of its existence in the Western Isles. It has a two year life-cycle and normally adults are reported only in even-numbered years.

Threats

Irresponsible collecting, by ripping up large areas of moss/lichen where the larvae pupate, has been a very localised threat in past years.

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

Slender Scotch Burnet (*Zygaena loti scotica*)

Ecology

This diurnal moth is associated with mosaics of grass and heath on south-facing slopes on the coast, where the larval foodplant, common bird's-foot-trefoil (*Lotus corniculatus*) grows. Land slips, erosion or grazing are essential in maintaining a short sward with bare ground.

Status

A UK Priority Species (DETR, 1999a).

Distribution

All of its very limited UK distribution is just outside this Region, on the islands of Mull and Ulva. Old records exist for Lochaline and Drimnin in West Inverness-shire.

Research and Survey

Detailed surveys have also been carried out on behalf of the Burnet Study Group (BSG) and on Mull and Ulva. Mainland sites have been searched with no success.

Action	BC's Targets	Potential Partners
Re-survey all historical sites	2002	BSG

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 (DETR, 1999b).

Distribution

The occurrence of this species in the Region is unclear, but there are apparently post-1960 but pre-1980 records from Arisaig in the West, and Loch Ness in the East.

Action	BC's Targets	Potential Partners
Undertake survey to assess status	2004	LBAP, SNH
Ensure all colonies receive appropriate management	2004	FC, SERAD, SNH, owners
Encourage research on habitat requirements and foodplants	2004	FC, SNH

Sword-grass (*Xylena exsoleta*)

Ecology

This moth is found on moorland and in open woodland, but little is known of its ecology. The larval food plants in the wild are not known, although it may feed on grasses initially, then move on to broad-leaved species. In captivity, larvae will eat on blackthorn (*Prunus spinosa*) and bird cherry (*P. padus*). Local but widespread in Scotland.

Status

A UK Priority Species (DETR, 1999a).

Distribution

Formerly widespread throughout the Region. In areas which are still monitored by light-trapping or sugaring it is still quite frequently reported. Therefore it is not clear whether there has been a real decline here - certainly nothing to compare with the drastic losses in England and Wales.

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

4.2 Medium Priority Species

Belted Beauty (*Lycia zonaria*)

Ecology

This is a machair and dune species, restricted in Scotland to the Inner and Outer Hebrides (albeit in extensive colonies) as far south as Islay (Greatorex-Davies, 1980). The larval food plants include common bird's-foot trefoil (*Lotus corniculatus*), yellow flag (*Iris pseudacorus*) creeping willow (*Salix repens*) and burnet rose (*Rosa piminellifolia*).

Status

Although the Belted Beauty appears on the list of UK Priority Species, it has been decided that this only applies to the Welsh populations, termed *Lycia zonaria britannica*. The Scottish populations (deemed to be a separate subspecies, *L. zonaria atlantica*) are regarded as less threatened, and are placed on the list of Species of Conservation Concern. Not all Lepidopterists accept the division into these subspecies.

Distribution

A species of the islands and only the extreme western tip of the mainland. It has a stronghold in the machair of the Outer Isles, where it can be abundant and was widely recorded in a survey in 1976 (Greatorex-Davies, 1980).

Management

Management plans designed to conserve machair are likely to benefit the Belted Beauty.

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

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 (*Ericaceae*) 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.

Threats

Unlikely to be significantly threatened at present. Perhaps in the, long-term climatic warming may have some impact.

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

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

Both older records and the relatively few recent ones show this species to be concentrated in two areas - the coastal strip on both sides of the Moray Firth, and the upper Spey valley in the area of Aviemore.

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

Forester (*Adscita statices*)

Ecology

Most Scottish sites are coastal grasslands with flushes that support sharp-flowered rush (*Juncus acutiflorus*), and have an abundance of the larval foodplants, common and sheep's sorrel (*Rumex acetosa* and *R. acetosella*) respectively.

Status

A UK Species of Conservation Concern.

Distribution

Most of its limited Scottish distribution is outside this Region. An old record exists for Lochaline in Lochaber.

Threats

Agricultural improvement and drainage. Afforestation

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

Goat Moth (*Cossus cossus*)

Ecology

The larvae spend three or four years feeding internally on the solid wood of various trees, including willow, oak, birch and ash, leaving the tree in the autumn to pupate on the ground.

Status

A UK Species of Conservation Concern.

Distribution

This little-recorded species is known from eight or so scattered locations on the east side of the Region, between Dingwall and Nairn and inland to Glen Affric, and in the west at Glengarry by Howard (1978). No other surviving Scottish populations seem to be known.

Threats

The reasons for its decline are unknown, although the loss of mature trees in native broad-leaved woodland is an obvious threat.

Site Safeguard & Management

Preserve mature and "over-mature" trees, particularly those with signs of exit holes.

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

Grey (*Hadena caesia*)

Ecology

This coastal species, whose larvae feed on sea campion (*Silene uniflora* - formerly *S. maritima*), is confined in Scotland to the Inner Hebrides and Ardnamurchan. (It is also found on the Isle of Man and coastal Ireland, although it has a montane distribution in Europe).

Status

A UK Species of Conservation Concern.

Distribution

This species is confined in Scotland to the Inner Hebrides and westernmost point of the mainland. Skye and the Small Isles are its stronghold.

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

Grey Scalloped Bar (*Dyscia fagaria*)

Ecology

This is a moorland species feeding 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 Highland Region, particularly in central and western parts. 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. In one it is almost wholly confined now to the Culbin Forest (a large coastal pine forest maintained by FE as a Forest Nature Reserve). In the other it is widespread and, very locally, not uncommon in the Spey valley between Grantown and Kingussie. Single records have come from other areas from time to time.

Threats

Forestry is sometimes claimed as a threat to this species, however a large proportion of known colonies are associated with areas of commercial forestry (Barbour, 1990).

Site Safeguard & Management

In a large forest complex such as Culbin, felled areas become colonised by young birch and are then suitable habitats for perhaps ten years until re-planted conifers become dominant again. If this process continues in a staggered rotation (in adjacent areas) a permanent population of the moth is ensured. Forestry Commission or other sympathetic forest managers should be advised to limit 'weeding' of colonist birch so as always to leave a reservoir of suitable habitat.

Action	BC's Targets	Potential Partners
Survey all known and potential sites	2005	FE, LBAP, SNH
Identify and protect core sites	2005	FC, 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 on at least two core sites	2005	FE, LBAP, SNH

Northern Arches (*Apamea zeta assimilis*)

Ecology

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

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 only occasional vagrant individuals being caught at light-traps in lower districts. The so-called Exile *Apamea zeta exulis* is the Shetland race of the same species.

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 moorland, where the larvae feed on various heaths and bog-myrtle (*Myrica gale*), and possibly also sallows (*Salix* spp.).

Status

The species qualifies as RDB3 "Rare", but no declines are apparent. Not listed in the UK BAP.

Distribution

Quite widespread in western and central areas, where it occurs in extensive areas of bog myrtle *Myrica gale*. There is a suggestion that it may have extended slightly further eastwards in recent years, e.g. it was found for the first time in Banffshire in 1985 (Young and Knill-Jones 1987)

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

Rannoch Sprawler (*Brachionycha nubeculosa*)

Ecology

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

Status

A UK Species of Conservation Concern.

Distribution

The Spey Valley around Aviemore is a traditional stronghold. It has also been confirmed recently, after a 40-year interval, in sites in Glen Affric and Glen Moriston.

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 old birch woodlands.

Action	BC's Targets	Potential Partners
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

Old records quite widespread particularly in the West, including Skye and the Small Isles.

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

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.

Status

A UK Species of Conservation Concern.

Distribution

The heath occurs on well-drained soils at intermediate altitudes (200-600m) in the eastern Highlands. In the survey reported by Young (1989) it was the most consistently-reported Lepidoptera species of this habitat.

Threats

Afforestation with conifers has been the fate of some sites in the past.

Encroachment by birch can occur if grazing is removed or drastically reduced.

Lack of heathland management which favours ling over 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.

Action	BC's Targets	Potential Partners
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

Transparent Burnet (*Zygaena purpuralis*)

Ecology

The Transparent Burnet is a day-flying moth with almost transparent grey-black wings marked with crimson streaks, and is on the wing between mid June and the end of July. It breeds primarily on coastal, south-facing slopes with short turf and patches of bare ground, which support the larval foodplant, common thyme (*Thymus praecox*).

Status

Not listed in the UK BAP, but known to be declining through survey work in recent years by the Burnet Study Group.

Distribution

The Scottish subspecies is the most widespread of the three known in the UK. It occupies south-facing cliff slopes, usually on basaltic or other base-rich substrates. It occurs in at least 30 colonies, on islands and the extreme western mainland, between Skye and the Mull of Kintyre (Bourn 1995). Of these colonies, about half are in our Region.

Threats

Lack of grazing. Isolation of colonies. Afforestation.

Research & Survey

The moth was studied at Talisker Bay, Skye and other sites by Bourn (1995). Research, survey, management and monitoring is co-ordinated by the Burnet Study Group.

Action	BC's Targets	Potential Partners
Identify and protect core sites	2002	BSG, FC, LBAP, SERAD, owners
Provide guidance to land management advisers	2002	BSG
Provide owners of all core sites with management guidelines	2002	BSG
Survey potential sites and known sites	2005	BSG, LBAP
Establish monitoring of at least one core site	2002	BSG, LBAP

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 discoveries have increased to four the known locations in the Region - in the valleys of the Shin, Einig, Affric and Moriston rivers. Undoubtedly other colonies in pine/birch woodland have been destroyed in the past through afforestation with conifers, but no old records exist of the moth from them.

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. This may require very long-term management (as now begun by SNH at Rannoch outside our Region), since birch is an essentially quite 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
Provide guidance to land management advisers	2003	FC, LBAP
Provide owners of all core sites with management guidelines	2003	FWAG, SAC

6 Key Areas for Butterflies and Moths in the Region

As a large area with an unusually large proportion of remaining semi-natural habitat, this Region is quite difficult to compartmentalise into key 'sites' or even key areas of particular Lepidoptera interest. However, there are several outstanding areas of entomological interest that have long been known, and one or two others that have been less publicised in the past. The following is an attempt to highlight the richest and most distinctive areas, but is by no means exhaustive.

Map 2 shows eight key areas, some of which are contiguous. They are however distinctive in their butterfly and moth fauna, and also separate very largely along the lines of the four main sub-regions shown in Map 1.

6.1 Moray Firth Coast

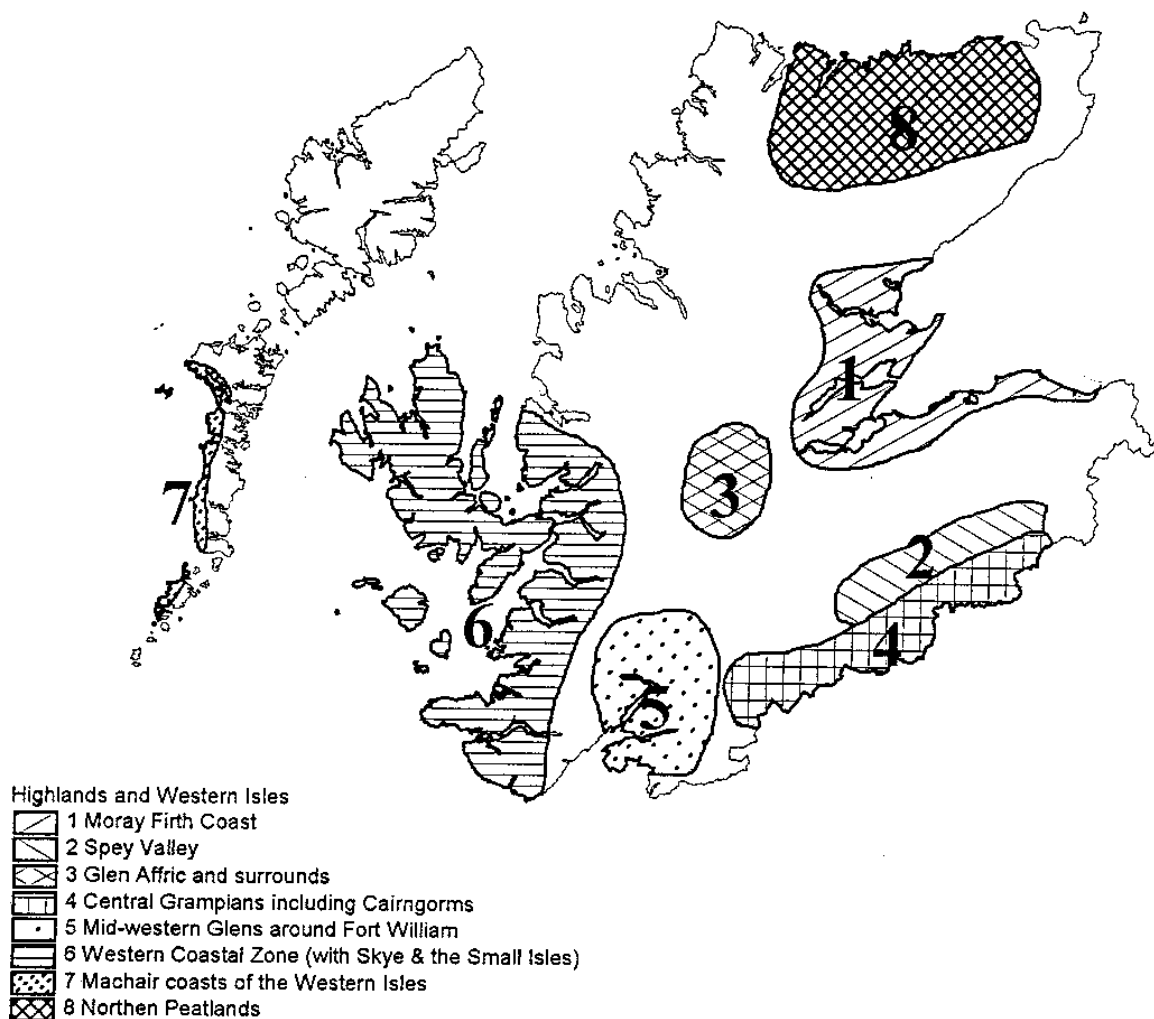
The coastal strip around the Moray Firth is the warmest and driest climatic zone of North Scotland. The geology is varied, and comprised of younger and less acid rocks than the majority of the Highlands. It is the richest in resident butterfly species (20+ species), having the majority of the Region's Small Blue and Dingy Skipper colonies, and a high proportion of the Northern Brown Argus and Grayling populations. The area around Forres, Findhorn and the Culbin sands was formerly a popular collectors' venue, being a stronghold of Kentish Glory and many of the scarcer coastal Noctuids including, at least formerly, the Lunar Yellow Underwing.

6.2 Spey Valley

The central Spey valley, roughly from Grantown to Newtonmore, is an area of continental-type climate with many special habitats and famously rare and special insect species. Perhaps the most renowned areas are the native Caledonian Pinewoods of Abernethy and Rothiemurchus. In addition to pine there are substantial areas of native broad-leaved woodland, which are home to Rannoch Sprawler, Kentish Glory and Dark Bordered Beauty. The bearberry heath habitat is extensive in the Valley, and supports Netted Mountain Moth, Small Dark Yellow Underwing and some very rare microlepidoptera. Wetland habitats are also well represented, for example at Insh Marshes, the largest fen in Scotland.

6.3 Glen Affric and surrounds

Four parallel east-west running glens - Strathfarrar, Affric, Moriston and Garry - form an area of special entomological interest which is probably equal to (and of quite similar character to) the better-known Spey Valley. Each of the glens has areas of native Caledonian Pinewood, the largest in Glen Affric which is being actively managed by Forest Enterprise as its major Caledonian Pinewood reserve. The butterfly interest includes probably the best populations of Pearl-bordered Fritillary on the east side of the Region, and among moths the Welsh Clearwing, Rannoch Sprawler and Goat Moth are locally recorded. The micro-moth *Choreutis diana* resident here is known from nowhere else in Britain. The fact that this area is still relatively less known entomologically means that further investigation and recording should be a priority.



Map 2. Key areas for Butterflies and Moths in the Region

6.4 Central Grampians including the Cairngorms

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 *Zygaena exulans* occurs in the eastern Cairngorms just beyond the boundary of our Region). Slightly lower mountains to the southwest, beyond the Drumochter Pass, are the regional stronghold of the Mountain Ringlet butterfly.

6.5 Mid-western Glens around Fort William

A high-rainfall area of high mountains and deeply-eroded valley systems. At low altitude this includes most of the distribution area of the Chequered Skipper, and also many good populations of the Pearl-bordered Fritillary. The Narrow-bordered Bee Hawk-moth was widely recorded here in earlier years, but apparently not confirmed recently. At higher altitudes on the mountain flanks are the northwestern-most colonies of the Mountain Ringlet.

6.6 Western Coastal Zone (with Skye and the Small Isles)

This has a very distinct insect fauna, as a result of a mild oceanic climate and extensive areas of volcanic (basalt) rocks. Several of the scarce Burnet moths (*Zygaenidae*), along with outlying colonies of Marsh fritillary and Forester moth have been recorded here. Skye and the Small Isles are strongholds of the Grey and the Belted Beauty. The Small Isles, lying south of Skye, include the island NNR of Rum and the island of Canna, made well known for its Lepidoptera through the discoveries of its owner the late J.L. Campbell.

6.7 Machair coasts of the Western Isles

The 'machair' is a unique formation of rich calcareous grassland on extensive shell sands, formerly fertilised with deposits of seaweed by the resident crofters. It occurs widely on the western coasts of the Hebrides and is particularly well developed in North and South Uist. Its most special Lepidopteran inhabitant is the Belted Beauty moth, which can attain huge population densities in places. It is also richly favoured by the few resident butterfly species, including Common Blue and the distinctive western form of the Dark Green Fritillary.

6.8 Northern Peatlands

This area, also known as the 'Flow Country' contains the largest extent of deep upland peat habitats. It became notorious for the conservation battle that arose when major parts of the area were ploughed and afforested with conifers, damaging the habitats of many rarer northern bird species. It has few special Lepidoptera (though it is more significant for other insects such as water-beetles). It was a major 'core area' for the Large Heath butterfly, though as noted in the species account here, there are many fewer recent records.

7 Survey

A major undertaking to survey key diurnal Lepidoptera species was made in 1994-95 by the Scottish Diurnal Lepidoptera Project (Pearce *et al.*, 1996). All of the Lepidoptera species targeted in that project are represented in the Highland Region, and knowledge of their distribution and, in many cases, habitat requirements was increased considerably.

For the butterflies this initiative has been maintained, in recording for the 'Butterflies for the New Millennium' mapping scheme which culminates in 1999. Our Region is, and has always been, one of the most incompletely-recorded for butterfly distribution. However we are confident that the Millennium Atlas will provide the best-yet picture of species distribution in the Region, and will be an improvement on the rather patchy coverage provided by Heath, Pollard and Thomas (1984). The efforts of local Butterfly Conservation Branch members in this have been greatly augmented by the recording done by visiting recorders from the south, some of whom have made special expeditions to investigate particular under-recorded areas.

On the moth side, coverage remains decidedly incomplete. Both local and visiting recorders have contributed to the UK Scarce Moth Network co-ordinated by Butterfly Conservation, and initiated by Dr Paul Waring. The Burnet Study Group has been a very important focus of activity and recording for the family *Zygaenidae*, of which we have a high proportion of the rarer British species.

8 Monitoring

The most important monitoring of Lepidoptera within our Region is carried on within two nationally-organised schemes.

Butterflies

For butterflies, the CEH has a network of transect-monitoring sites forming their Butterfly Monitoring Scheme (BMS). Transects of the BMS are usually done at sites such as NNRs, where a permanent member of staff is on hand to monitor changing weather conditions, and to carry out the weekly transect if and when weather allows.

BMS transects in the Region (Greatorex-Davies & Pollard, 1998, Greatorex-Davies pers. comm.):

Site	Ownership	Date transect began
Ariundle	SNH	1989
Glen Strathfarrer	SNH	1996
Insh Marshes	RSPB	1977
Loch Garten	RSPB	1977
Pollymore	SNH	1991
Loch Fleet	SNH	1996
Creag Meagaidh	SNH	1999

There are also several non-BMS transects using similar methodology in the Region, but data sets are generally less complete. This is however an inadequate number of transects to determine regional, species or habitat trends. In addition, an unfortunate recent development has been the loss of field-based staff within the conservation agencies such as SNH. This has led to the interruption of some valuable long-running transects, and patchy data from others. Whilst the best solution to this would be the re-commitment of resources within these organisations, realistically it may fall to Butterfly Conservation to try and fill the gap.

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 outwith the BMS is now being collated by Butterfly Conservation, and we are keen to hear of any ongoing butterfly monitoring in the Region (see Appendix VII).

Moths

For moths, the problems of long-term monitoring are even more acute. Valuable monitoring of Burnet moths has been carried out by Burnet Study Group members, but for the vast majority of moths, the non day-flying species, the best monitoring is provided by the national network of light-traps run by the Rothamsted Insect Survey. The numbers of traps operating locally varies from year to year, but it is believed only about four or five are currently operating within our Region. The Rothamsted traps are designed to catch only a small representative sample from the local moth fauna, thus are not ideally suited for monitoring rare species. Nevertheless some important information on e.g. the Slender-striped Rufous and the Northern Dart has been gained from the operation of these traps.

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 present 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 private 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 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 often 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).

10 Other activities

The following other activities are also seen as priorities for Butterfly Conservation's Highlands Branch:

Expansion of membership

The current membership of around 50 is barely sufficient to maintain the functions of an active branch, yet it is known that there are many people with an interest in butterflies or moths living within the Region, who are potential members of Butterfly Conservation.

Collation of information obtained locally within national recording schemes

Data obtained from BMS transects or Rothamsted light-traps are currently fed in to the national co-ordinators with little or no general feed-back to the local biological recording community. The local Branch may be able to assist disseminating such information.

Liaison with Local Authorities over the production of LBAPs

At the time of writing, LBAPs have been compiled for the North-east Scotland Region (Alexander *et al.*, 1997) and for the Cairngorms (Leaper, 1998), both of which overlap substantially with this Region. Information and comments have been provided to both by Butterfly Conservation members living in the respective areas, but this role should be formalised, and a pro-active approach should be taken when other authorities within the Highland region come to prepare their LBAPs.

Liaison with other conservation and recording groups

In particular the Highland Biological Recording Group which published 'Highland Butterflies' (Stewart, Barbour and Moran, 1998) with co-operation and financial assistance from Butterfly Conservation.

11 Review

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

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

P = principle habitat; S = secondary habitat

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

Taken from Bland & Young (1996).

Category X	“Extinct or close to extinction”
<i>Paraleucoptera sinuella</i> <i>Plutella haasi</i> <i>Gypsonoma nitidulana</i> <i>Insturgia limbaria</i>	
Category 1A	“Very restricted distribution, potentially in urgent need of protection”
<i>Parornix alpicola</i> <i>Choreutis diana</i> <i>Swammerdamia passerella</i> <i>Colephora arctostaphyli</i> <i>Dichomeris juniperella</i> <i>Pammene leudersiana</i>	
Category 1B	“Potentially in need of conservation”
<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 eskoi</i> <i>Depressaria silesiaca</i> <i>Levipalpus hepatariella</i> <i>Exaeretia ciniflonella</i> <i>Cydia cognatana</i> <i>Oletheutes metallica</i> <i>Acleris lipsiana</i> <i>Eudonia alpina</i>	
Category 2A	“Very restricted distribution, in urgent need of protection”
<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 was 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 Highlands and Western Isles, in taxonomic order.

Common Name	Latin Name
Chequered Skipper	<i>Carterocephalus palaemon</i>
Dingy Skipper	<i>Erynnis tages</i>
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>
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>
Marsh Fritillary	<i>Euphydryas [=Eurodryas] aurinia</i>
Speckled Wood	<i>Pararge aegeria</i>
Mountain Ringlet	<i>Erebia epihron</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:

Species	Date published
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).

Appendix VII Butterfly Conservation Contact Points & Objectives

Contact Points for the Highlands Branch

Branch Organiser	Jimmy McKellar	24 Scorguie Gardens, Inverness, IV3 8SS	01463 241165	Jimmy@mckellar93.freeserve.co.uk
Branch Recorder	Dr. David Barbour	125a High St, Aberlour, Banffshire AB38 9PB	01340 871850	Dfbis@aol.com
Butterfly Monitoring (Scotland)	Pete Kinnear	20 East Queen St., Newport-on Tay, Fife, DD6 8AY	01382 541383	

Butterfly Conservation 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 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
NFUS	National Farmers Union of Scotland
NTS	National Trust for Scotland
NNR	National Nature Reserve
RSPB	Royal Society for the Protection of Birds
SAC	Scottish Agricultural College
SDLP	Scottish Diurnal Lepidoptera Project
SERAD	Scottish Executive, Rural Affairs Department
SLF	Scottish Landowners' Federation
SNH	Scottish Natural Heritage
SWT	Scottish Wildlife Trust