



Species Action Plan

LARGE BLUE *Maculinea arion*

March 1995

Prepared by Butterfly Conservation in association with the Joint Committee for the Re-establishment of the Large Blue Butterfly.

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THIS PROJECT IS SUPPORTED BY



This species action plan is an unpublished working document produced in association with the Joint Committee for the Re-establishment of the Large Blue (JCCLB) in the UK over the next five to ten years. It has been prepared under the Action for Butterflies project which is funded by WWF-UK, English Nature, the Countryside Council for Wales and Scottish Natural Heritage.

The Action Plan was prepared with the help of members of the JCCLB including Jeremy Thomas (ITE), Alan Kennard (JCCLB Chairman), Dave Simcox (JCCLB), Adrian Spalding (JCCLB), Dave Sheppard (EN HQ), Matthew Oates (NT), Christopher Hancock (SWT) and Mike Wilkinson (EN Three Counties Team) as a framework for seeking funds to implement a programme over the next ten years. For abbreviations see page 15.

Outline Paper (First Draft)	: December 1994
Pathfinder Meeting	: January 1995
Second Draft	: February 1995
Final Draft	: March 1995

Butterfly Conservation (the British Butterfly Conservation Society) has an overriding objective to ensure a future for butterflies, moths and their habitats. In order to achieve this objective its aims are to:

- raise public awareness of the plight of our butterflies and moths and encourage public involvement in conservation.
- halt the decline of butterflies and moths and maintain or improve the present status of threatened species.
- improve the extent and suitability of key lepidoptera habitats and the environmental quality of the countryside as a whole for all lepidoptera species.
- work with and advise other conservation groups, local bodies and agencies on techniques of land management which favour butterflies and moths and related wildlife.
- acquire and manage habitats for butterflies and moths.
- encourage the research (both at amateur and professional levels) on butterflies and moths.
- support and encourage butterfly and moth conservation world-wide.

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Summary

- The Large Blue, *Maculinea arion* is listed in the UK Red Data Book as an endangered species, dependent on highly specialised habitat in warm, arid, well drained unimproved grassland. It is endangered in Europe, and protected under the Bern Convention and Habitats Directive. Its world status is vulnerable.
- The Large Blue became extinct in Britain in 1979, and the five colonies that are now present follow re-establishment at former sites using Swedish stock.
- The main future threats to this species are the small size of individual populations; the deterioration of habitat; climatic conditions; and practical difficulties of implementing ideal management regimes.
- The broad objectives of the plan are to ensure that the existing British colonies are maintained and that there is an upward trend in numbers of colonies over the next five to ten years. The plan also aims to foster and promote the conservation of all Large Blue butterflies throughout their world range.
- The objectives of the plan will be achieved by protecting and conserving the sites and butterflies where colonies have already been re-established, ensuring that appropriate management for the Large Blue is continued. A viable network of colonies will be created through the reintroduction of the butterfly to additional sites, as they become suitable through appropriate management. Further research on the Large Blue will be supported, especially habitat management techniques. The Action Plan and the conservation of the Large Blue will be publicised and funds sought to ensure the proposed strategy can be accomplished.
- The Action Plan embodies the concept that a wide range of other rare insect species, as well as animal and plant species benefit from the habitat conditions which are ideally suited to *Maculinea arion*.
- The Action Plan covers the next ten years, will be monitored annually and reviewed in 2000 or such earlier time as the situation demands.

Part 1 Overview

1.1 PRIORITY STATEMENT

The Large Blue, *Maculinea arion* is included in the British Red Data Book of Insects (Shirt 1987) under the endangered category and is protected under the Bern Convention. It is currently listed as vulnerable in the IUCN (World) Red Data Book (IUCN 1990) and as an endangered species in Europe (Heath 1981). A resolution passed by the *Societas Europaea Lepidopterologica* and the Lepidopteran Specialist Group of IUCN defined the conservation of the Large Blue butterflies as a priority area (Wells, Pyle & Collins 1983, Thomas 1984). High priority should be afforded to conservation action to increase the size and number of Large Blue colonies in the UK.

1.2 BROAD OBJECTIVES

1. To maintain and enhance existing colonies.
2. To create a viable network of Large Blue colonies in the UK by establishing the butterfly in a minimum of 10 sites based on its former range (to include the Cotswolds, Poldens, Mendips, Dartmoor, South Devon coast and North Atlantic coast).
3. To establish an upward trend in numbers of colonies and range.
4. To encourage the conservation of all Large Blue butterflies throughout their world range.

1.3 LEGAL STATUS

The Large Blue was first protected in the UK under the Conservation of Wild Creatures and Wild Plants Act 1975, and is listed on Schedule 5 of the Wildlife and Countryside Act 1981. It also is listed under annex IV of the EC Habitats Directive (1992) as a species requiring strict protection and is protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Berne Convention). (NB It is not listed on Annex II of the Habitats Directive as a species requiring designation of Special Areas of Conservation). The Large Blue is protected in many other European countries. Implications of the above legislation in the UK are given in Appendix 1.

1.4 Status and Level of Biological Knowledge of the Large Blue in the UK.

Population	-size	5 re-re-established colonies in the UK (size monitored annually)
	-trend, numbers	moderate increase upward
	-trend, range	moderate expansion in range following re-establishment
Knowledge of	-status	distribution well defined
	-trends	well quantified and recorded
	-conservation requirements	excellent knowledge available of suitable grazing management

Part 2 Biological Assessment

2.1 INTRODUCTION

The British populations of the Large Blue, *Maculinea arion* (Higgins and Riley 1975) became extinct in Britain in 1979 (Thomas 1980). Re-establishments using stock from Sweden have recently been made to five sites in England and although it is too early to be certain of success the results to date are promising. The future maintenance of the re-established colonies depends on continued management (e.g. grazing) of the semi-natural grasslands where the butterflies breed (Thomas 1994).

2.2 ECOLOGY

In Britain, the Large Blue occurs on warm and arid (well-drained) unimproved grassland and is ecologically highly specialised. It is univoltine and adults are short-lived (average lifespan 5-7 days). Females lay eggs on the flower buds of wild thyme, *Thymus praecox*. The first three larval instars feed on the thyme flowers and the fourth drops to the ground and thereafter depends on the attentions of *Myrmica* (red) ants. The larvae are carried into *Myrmica* nests, where they feed on ant eggs and the larvae prepupae; this is its major growth stage. Larvae hibernate and pupate inside ant nests, and the adult Large Blue emerges in late June to mid July.

Any species of *Myrmica* ant will adopt the larvae when they leave the foodplant, but the Large Blue is essentially dependent on *Myrmica sabuleti* for successful rearing: Larvae can develop in nests of *Myrmica scabrinodis* but survival rates are very poor and this species of ant cannot support a population of Large Blues alone (Thomas *et al.* 1989).

Both species of *Myrmica* are common where thyme grows, but a high density of *M.sabuleti* with thyme within 2m of their nest entrance is needed for the good survival of Large Blue. The *M.sabuleti* colonies vary greatly in size and the number of larvae they support (Elmes and Wardlaw, 1981, 1982a). Many are too small to support even a single Large Blue larva. (Thomas and Wardlaw 1992). In practical terms this means that suitable ant/plant conditions should extend over as large an area as possible to ensure a large and robust population of Large Blue sufficient to withstand catastrophic mortalities due to chance factors such as extreme weather and larval overcrowding (Thomas 1980, 1994, Elmes and Thomas 1992). *M.sabuleti* requires extremely warm microclimates and is abundant only in south-facing, short-grazed turf, typically less than 2-3 cm tall (Thomas 1994). Sward height is therefore vital; if grazing is removed so that the height exceeds 4cm, *M.sabuleti* declines substantially, and *M.scabrinodis* becomes more abundant. The size of a Large Blue colony in Britain is thus correlated to the number of *M.sabuleti* nests present which in turn is correlated with the amount of short turf. This contrasts with warmer climates further south in Europe where the Large Blue has less specialised requirements and breeds in taller turf (Thomas 1993).

The largest known former Large Blue colonies in England covered 10-20ha where there were probably a few thousand thyme plants and *M.sabuleti* nest densities of one every 1-2m² (Thomas 1976, 1994). Small colonies occurred on areas of less than 1ha if >60% of the ground was occupied by *M.sabuleti*. Thomas (1991) believed that a safe population of 400-1000 adults could be supported on 1ha under ideal conditions; populations with less than 400 adults (reflecting around 2500 *M.sabuleti* nests) might undergo periodic extinctions.

In contrast to some insect species, mark-recapture experiments have shown that adult Large Blues live in closed populations with little or no migration between adjoining sites. This information suggests that efforts should be concentrated on maintaining populations at high levels and covering as large an area as possible. There is also a need for habitat diversity in each site to prevent the chance of extinction through catastrophic events e.g. droughts. In addition different sites should have a wide range of habitats of different aspect, soil depth etc. so that the Large Blue, *M.sabuleti* and thyme are able to cope with varying seasonal conditions. Although clusters of sites are desirable, large isolated sites that are managed to produce a variety of habitats should also be suitable for the Large Blue.

2.3 DISTRIBUTION AND POPULATION

The Large Blue occurs from western Europe to southern Siberia, Armenia, Mongolia and China. It became extinct in Britain in 1979 despite valiant long-term efforts to save it. The species is also extinct in the Netherlands and there remains only one colony in Belgium. The population has been reduced to less than ten colonies in most northern European countries (Tax 1989, Thomas and Elmes 1992). At present, biotope destruction is a major threat to Large Blue populations in Mediterranean Europe, especially Spain (Munguira 1987), southern France and northern Italy (Balletto and Cascale 1991) and in all Eastern European countries.

The Large Blue was first discovered in Britain near Bath by Lewin in 1795. It has been recorded from about 90 sites since then, though the exact number is rather imprecise as some sites were continuous and others may not have been self-supporting. Colonies probably comprised from a few ten to a few hundred adults, the largest probably contained up to 2000-5000 adults in their "best" years (Thomas and Emmet 1989). In general the colonies were isolated from each other and essentially closed, as adult dispersal was poor.

The former distribution of the Large Blue by 10km squares is shown in figure 1.

Most sites (87%) occurred in six discrete regions on several geological formations (mainly limestones, culm measures, and mica schists). Extinction in the six main English areas occurred as follows; colonies in Northamptonshire died out around 1860; South Devon in 1906; Somerset in the late 1950s; Cotswolds in 1960-1964; Atlantic coast of Devon and Cornwall in 1973 and Dartmoor in 1979. Only two sites remained by 1972, and the butterfly finally became extinct in Britain in 1979 when the reared female offspring of the last remaining female died before any males emerged (Spooner 1963, Thomas 1980).

2.4 LIMITING FACTORS

Historical

Site destruction through improvement for agriculture (by treatment with herbicides or fertilisers, or more direct conversion by ploughing or drilling) accounted for about half of the known colonies. The other sites deteriorated following abandonment and cessation of traditional stock grazing which led to an increase in turf height and loss of the ant host, *M.sabuleti*. This process was aided by the spread of myxomatosis in the 1950s and the removal of rabbit grazing. Although *M.sabuleti* disappeared rapidly as turf height increased, thyme could persist in sward up to 10cm, but it too eventually declined in abundance and few

seedlings became established. Several populations of the Large Blue on nature reserves disappeared because of undergrazing which led to replacement of the essential ant host with *M.scabrinodis*.

Current and Future Limiting Factors

Homogeneity of habitats within sites.

Droughts (affecting flowering of thyme and size of ant populations).

Practical difficulty of implementing ideal management regimes (e.g. especially controlling timing, nature and intensity of grazing).

Uncertainty of future rabbit populations due to rabbit haemorrhagic disease.

Potential donor populations are now very limited in Europe.

Uncertainty of financial climate (including most conservation grant schemes) and changes in agricultural policy.

Knowledge of and communication with site managers.

Collecting is potentially a minor threat (plus visitor pressure on some sites).

2.5 RESUME OF CONSERVATION TO DATE

The disappearance of Large Blue colonies caused enormous concern among entomologists as long ago as the mid-19th Century (Spooner 1963). The first active conservation attempt was the establishment of the Dizzard Valley Butterfly Reserve on the Cornish coast in 1931. The site was wardened and collectors deterred. The reserve failed to conserve the Large Blue however as grazing and gorse burning were also terminated and the site rapidly became unsuitable as a breeding ground (Oates 1994).

The next most notable conservation event was the formation of a Joint Committee for the Conservation of the Large Blue Butterfly (JCCLB) in 1962. It was founded by the Devon and Cornish Naturalists Trust, with the aim of bringing together statutory and voluntary bodies that had an interest in the butterfly and an ability to influence and aid its conservation. These included the Nature Conservancy Council, the National Trust, the Royal Society for Nature Conservation, the Royal Entomological Society and Butterfly Conservation. The JCCLB co-ordinated extensive surveys, site wardening, site protection from agricultural improvement, an ecological assessment of requirements and in one case site purchase. Despite its efforts, the full knowledge of the butterfly's requirements came too late to arrest the decline and by 1972 remained in only two sites.

At this point when most of the conservation options had been tried and found wanting, it was decided that a full-time study of the butterfly's ecology was needed in order to ascertain if there was any vital information that had been missed. Since then Dr Jeremy Thomas, with many co-workers, has carried out extensive ecological studies on the Large Blue. This research led to crucial advances in our knowledge of the butterfly's requirements and that of its ant host. Having obtained a sound scientific base, the habitat on several former Large Blue sites has been restored by prescription grazing (and in some cases scrub clearance and thyme planting). This has resulted in a substantial increase in *M.sabuleti* populations on several sites making them suitable candidates for attempting to re-establish the Large Blue. The re-establishments were started in the early 1980s using Swedish stock. A trial re-establishment

in 1983 was followed by a major release on the last former site on the edge of Dartmoor in 1986. Seven butterflies emerged in 1984 and small numbers were present in 1985 and 1986. About 200 additional larvae were imported in 1986; some 75 adults emerged in 1987 and 150-200 in 1988. Suitable habitat at the site was extended by burning and grazing a similar sized adjoining area so that natural colonisation of *M.sabuleti* occurred. Thomas (1994) then estimated that the site could support around 2000 butterflies. Recent research by Thomas has shown that a wide range of other rare insect species, as well as animal and plant species benefit from the habitat conditions which are ideally suited to the large Blue (New *et al.* 1995, Thomas, 1995).

Re-establishments have now been made to four other sites including the Cotswolds, the Poldens and the Mendips, and the populations will be monitored for several years. This work is currently being carried out under the English Nature Species Recovery Programme by ITE in conjunction with Butterfly Conservation and a range of organisations, under the auspices of JCCLB (which has become the Joint Committee for the Re-establishment of the Large Blue). Species Recovery Programme funding will end in April 1996.

Part 3 Actions and Work Programme

3.1 POLICY AND LEGISLATIVE

**Organisation(s)
primarily
responsible**

Action 1 Priority: HIGH

Maintain and develop liaison with conservation and land use agencies under the umbrella of the JCCLB.

**All with
JCCLB to co-
ordinate**

Action 2 Priority: HIGH

Encourage a financial climate for appropriate management of potentially suitable areas.

All

Action 3 Priority: MEDIUM

Work with Government and others to develop appropriate policies for the conservation of the Large Blue.

EN, BC

3.2 SITE SAFEGUARD AND ACQUISITION

Action 4 Priority: HIGH

Safeguard all potential re-establishment sites on the priority list once these are identified (see also Action 20 in Future Research and Monitoring).

All

Action 5 Priority: HIGH

SSSI designation should be extended to all Large Blue sites following successful re-establishment.

EN

Action 6 Priority: HIGH

Oppose any development proposals threatening target and other potential introduction sites.

All

3.3 LAND MANAGEMENT

Action 7 Priority: HIGH

Manage all holdings and adjacent peripheral areas, subject to agreements, to ensure suitable habitat including planting wild thyme if necessary using a local source. **All**

Action 8 Priority: HIGH

Ensure positive management of all SSSIs with Large Blue populations through management agreements. **EN and land managers**

Action 9 Priority: MEDIUM

Acquire key sites within each target area whenever possible as a preferable option to management agreements. **NT,EN,BC**

Action 10 Priority: MEDIUM

Ensure beneficial land management for the Large Blue in priority areas (see Action 19) by including appropriate prescriptions in management contracts for Environmentally Sensitive Areas (ESAs) and other agri-environment regulation schemes. **BC,MAFF,EN etc.**

Action 11 Priority: MEDIUM

To integrate management of the Large Blue with the needs of other calcicolous grassland species especially warmth-loving fauna and flora characteristic of short sparse turf, and develop an overall Action Plan for the biotope. **All**

3.4 SPECIES MANAGEMENT, PROTECTION AND LICENSING

Action 12 Priority: HIGH

Institute re-establishments following successful habitat restoration on a minimum of 10 sites based on its former range. **ITE**

Action 13 Priority: HIGH

Report all incidences of collectors to the appropriate authorities (i.e. police, EN).

All

Action 14 Priority: MEDIUM /LOW

Arrange low key wardening at all existing and future re-establishment sites to prevent illegal collecting or accidental disturbance and to assist with monitoring. Local involvement should be encouraged where appropriate.

All

3.5 ADVISORY

Action 15 Priority: MEDIUM

To give training to and liaise with site managers, ensuring follow-up advice and feedback.

ITE

Action 16 Priority: LOW

Produce a simple advisory guide on how to manage land for the Large Blue for circulation to landowners and managers in target regions.

ITE

3.6 INTERNATIONAL

Action 17 Priority: HIGH

Encourage governments and conservation agencies to cooperate with the conservation of Large Blue butterflies and their parasitoids throughout their range.

**JNCC,
JCCLB**

3.7 FUTURE RESEARCH, SURVEY AND MONITORING

Action 18 Priority: HIGH, ESSENTIAL

Compile a priority list of potentially suitable sites within two years of the plan which will include

- 1) currently suitable sites (with willing landowners).
- 2) sites that are suitable but not available at present.
- 3) potential sites that need a lot of work.

**ITE to co-ordinate
WTs and
BC**

There should be continuous revision of the site database with a more formal revision every five years.

Action 19 Priority: HIGH

Monitor all re-established populations; both in the adult or egg stages, and populations; density and distribution, other habitat indicator species and habitat conditions (with fixed point photographs).

ITE to co-ordinate

Action 20 Priority: MEDIUM

To support research and publication of research on the Large Blue, including Large Blue habitat management techniques, and assess future needs in light of the research.

EN,BC

Action 21 Priority: LOW

Analyse data on re-establishments and population trends, and revise population models and predicted survival rates.

ITE

3.8 COMMUNICATIONS AND PUBLICITY

Action 22 Priority: HIGH

Raise funds to ensure all actions can be conducted.

BC to co-ordinate.

Action 23 Priority: HIGH

Publicise as appropriate this Action Plan and effort to conserve the Large Blue.

BC to co-ordinate.

Action 24 Priority: MEDIUM

Write scientific and popular articles on the project and benefits to related species. **ITE,BC**

3.9 REVIEW

Action 25 Priority: HIGH

Monitor the Action Plan annually and review in 5 years. **All**

Key to Abbreviations

All - all the organisations named separately below

BC - Butterfly Conservation

EN - English Nature

ESA - Environmentally Sensitive Area

ITE - Institute of Terrestrial Ecology

JNCC - Joint Nature Conservation Committee

LB Committee - Joint Committee for the Re-establishment of the Large Blue Butterfly

NT - National Trust

SWT Somerset Wildlife Trust

WTs - Wildlife Trusts

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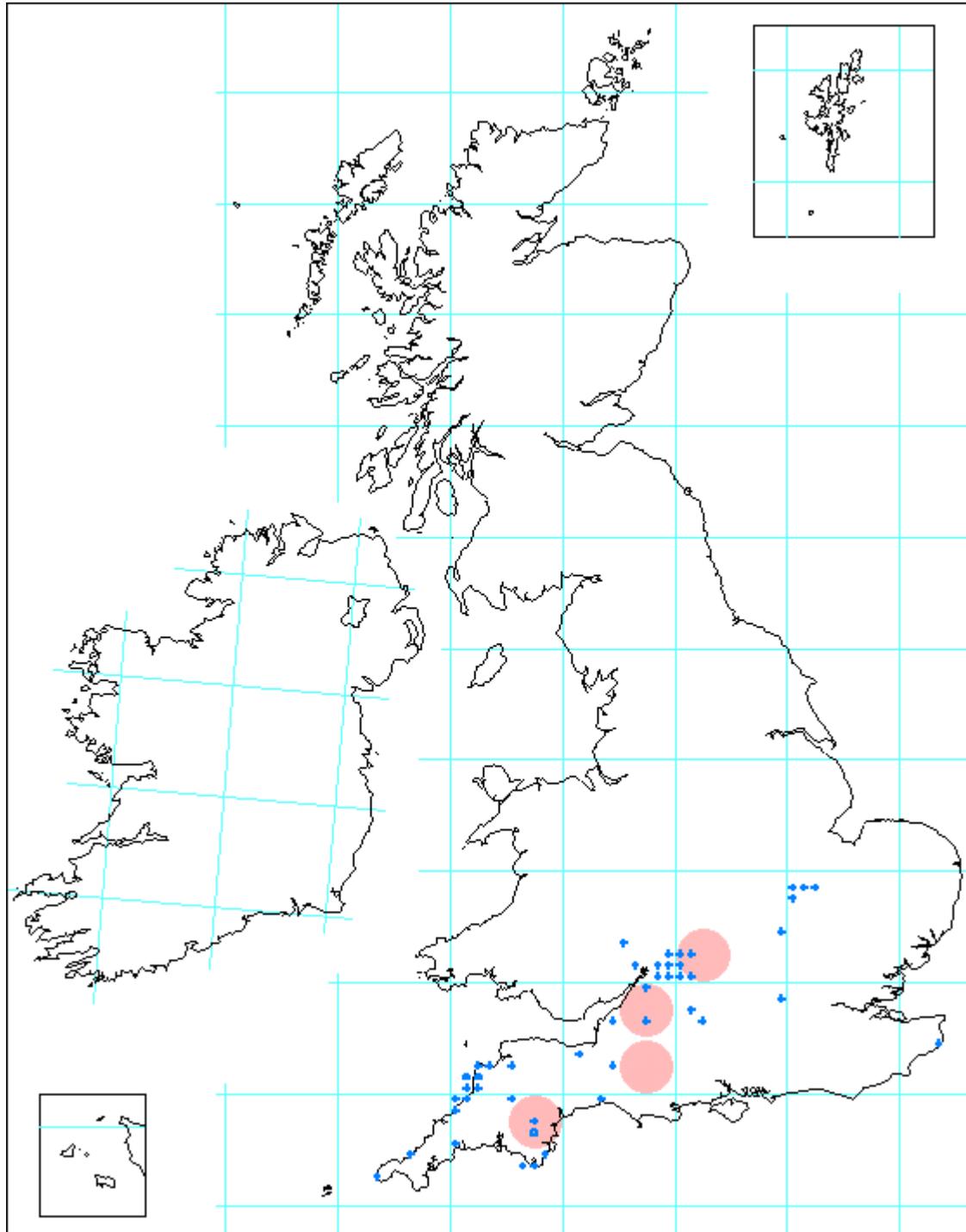
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Figure 1 The former distribution and restoration sites of the Large Blue in Britain

Butterflies for the New Millennium project (2001).
Copyright of Butterfly Conservation/Biological Records Centre.
(Large spots show areas of the restoration sites ; open circles all records between 1970-1982; cross all pre 1970 records).



Appendix 1

Implications of the Wildlife and Countryside Act 1981 in the UK

The Wildlife and Countryside Act 1981 gives limited protection to the Large Blue butterfly.

Under this Act it is a criminal offence if any person:

- intentionally kills, injures or takes a specimen from the wild (this, in effect prohibits collecting for any purpose).
- has in their possession or control any live or dead wild specimen or any part of or anything derived from such specimen.
- sells, offers or exposes for sale, or has their possession or transports for the purpose of sale, any live or dead specimen (the object is to prevent trading).

Ova, larva and pupa as well as mature insects are covered by the Act. It is presumed in law that the specimen in question comes from the wild, unless the contrary is shown.

Licences

English Nature may grant a licence for collecting or possession which otherwise would be an offence. Licences may only be granted for certain purposes relating to scientific research, education, conservation or introductions to particular areas.