Species Action Plan

GLANVILLE FRITILLARY
Melitaea cinxia

March 1997

'This fly took its name from the ingenious Lady Glanvil, whose memory had like to have suffered for her curiosity. Some relations that was disappointed by her Will, attempted to let it aside by Acts of Lunacy, for they suggested that none but those who were deprived of their senses, would go in Pursuit of butterflies.' Mosses Harris, 1776.

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This species action plan is an unpublished working document produced by Butterfly Conservation to focus and co-ordinate the conservation of the Glanville Fritillary in the UK over the next five to ten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 in consultation with the following organisations in the hope that they will participate in the actions outlined: English Nature, The National Trust, MAFF/ADAS, WWF-UK, ITE, and the Isle of Wight Natural History & Archaeological Society.

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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.

CONTENTS

Summary

• The Glanville Fritillary is a highly restricted species in the UK being confined to the south coast of the Isle of Wight. It also occurs in the Channel Islands. Historically a few sites were known in east Kent and Hampshire although the majority of the latter records are believed to be introductions. There is a small introduced population on the Somerset coast. While the range of the species has remained stable in the last few decades there have been changes within sites and in the abundance of the species. The Glanville Fritillary is listed under Schedule 5 of the Wildlife and Countryside Act for sale only.

• A **medium** priority is afforded to the conservation action in this plan to protect and increase the number of Glanville Fritillary colonies in the UK.

•The Glanville Fritillary occurs on soft undercliff grassland and the slopes above where its main larval foodplant *Plantago lanceolata* occurs in abundance on sheltered, south facing slopes.

• The main threats to the Glanville Fritillary are inappropriate coastal defence projects, which stabilise the eroding cliffs where it occurs, high grazing levels by rabbits or sheep, inappropriate tourist development and changes in the rate of erosion due to climate change. The impact of sea level rise on the species is difficult to predict and will depend on man's response to this threat.

• The immediate major objectives of the plan are to maintain viable networks of populations throughout its current range on the Isle of Wight, to conduct research on the distribution and ecology of the species and to continue the monitoring programme to enable its effective conservation.

• The objectives of the plan will be achieved by improving information on and dissemination of the habitat requirements of the species.

• The Action Plan covers the next ten years, will be monitored annually and reviewed as the situation demands.

Part 1 Overview

1.1 PRIORITY STATEMENT

While the Glanville Fritillary has not suffered the severe declines of many other butterflies, it remains a highly vulnerable species because of its highly restricted distribution and susceptibility to natural changes in the rate of slippage on its soft cliff sites. It is listed as a species of conservation concern (long list) in Biodiversity: The UK Steering Group Report (DOE, 1995). Based on our current knowledge, a **medium** priority should be afforded to conservation action to protect and increase the number of Glanville Fritillary colonies in the UK. However, it is precarious due to large population fluctuations and restriction to just 5 - 8 core colonies.

1.2 BROAD OBJECTIVES

1. Maintain viable networks of populations throughout its current range.

2. Conduct research on the ecology and viability of Glanville Fritillary populations and its parasitoids.

3. Continue monitoring programme.

1.3 LEGAL STATUS

The butterfly is listed on Schedule 5 of the 1981 Wildlife and Countryside Act (for sale only). The majority of core colonies occur on National Trust land where collecting is prohibited by Trust bye-laws.

1.4 Status and Level of Biological Knowledge

Population	**-size**	**Good**
	-trend, numbers	**Good**
	-trend, range	**Good**
Knowledge of	**-status**	**Good**
	-trends	**Good, most sites monitored annually**
	-conservation requirements	**Good ecological knowledge of its requirements.**

Part 2 Biological Assessment

2.1 INTRODUCTION

The Glanville Fritillary, *Melitea cinxia* is one of Britain's rarest Butterflies, being confined to fewer than 15 colonies on the south facing cliffs of the Isle of Wight, although there are occasional short lived colonies inland and even on the nearby Hampshire coast. Most populations occur on the under cliff grassland of the Wealden clays and the sheltered face of the Upper Greensand cliff behind it. These areas have a large amount of the main larval foodplant Ribwort Plantain, *Plantago lanceolata* present. However, females select only small leafed Plantains for egg laying, where the microclimate is particularly hot. A secondary foodplant Buck's-horn Plantain, *Plantago coronopus* is occasionally eaten by final instar larvae.

2.2 ECOLOGY

Life Cycle

The butterfly is univoltine in Britain and bivoltine in southern Europe. Rarely, in good years in Britain there is a partial second brood in August (Pope, 1988). In normal years the adults fly in late May and June. The Glanville Fritillary is an agile flyer, the males patrol along suitable habitat constantly investigating golden objects in the hope of finding the less conspicuous females which remain in dense tussocks for long periods (Thomas and Lewington, 1991). Mating occurs around mid-day, and as the female often continues to fly from flower to flower, mating pairs are very conspicuous. The butterfly forms close knit colonies but, one or two adults are seen inland from the main breeding sites in most years, and there are occasional sightings on the mainland. Marking experiments indicate a small interchange of adults between chines and undercliffs, of the order of c.1-2% of the population between sites separated by up to 0.5km (J. A. Thomas, pers. comm.).

Females lay egg batches comprising 50 - 200 eggs on the undersides of leaves of the larval food plant, Ribwort Plantain, *Plantago lanceolata*. While this is a common, widespread plant, females select small, young plants, generally growing, at very high densities on sheltered south facing slopes. The more southerly the aspect, the more tolerant of taller vegetation, although the species is still restricted to the very shortest vegetation on these slopes. The larvae live gregariously from August to March in dense webs, spun over the clumps of young plantains, usually *P. lanceolata* but occasionally on *P. coronopus*.

By the autumn the larvae have reached their 5th instar and move to slightly taller vegetation where they spin a much denser nest as a hibernaculum within which they overwinter. The larvae spin small silk pockets, suspended like miniature hammocks within the hibernaculum where the larvae gather to hibernate in small groups. The larvae appear again in March. This spring feeding is critical, with c.95% of the body weight developing at this time, when the main growth of plantain also occurs. The larvae spend much of the day basking on top of their webs, leaving to feed only when they have reached a high body temperature. Recent work by Dr J A Thomas and his co-workers has shown that the larvae need to reach an active

body temperature of 34°C (pers. comm.). This can be reached by the larvae when the ambient temperature at the soil surface is over 13°C, while air temperature can be as low as 7-10°C in the sheltered slopes where the butterfly occurs. It is the requirement for a continuous supply of very high densities of young plantains in such a warm location which limits the Glanville Fritillary to the south facing, eroding cliffs of the Isle of Wight. Towards the end of the sixth and final instar, in April, the larvae are typically solitary, moving quite large distances to feed on young fresh plantains.

The pupae are difficult to find, usually being in dense matted tussocks of grasses, especially fine grasses such as *Festuca rubra* (M. Oates, pers. comm.). The presence of tall vegetation nearby may be crucial to the species.

In Britain, the Glanville Fritillary supports populations of the parasitoid, *Cotesia melitaearum*, (Wilkinson) (Braconidae: Microgastrinae) which has no other host on the Isle of Wight. However, no systematic study has been made of the parasitoids of the Glanville Fritillary and this may be an important component of the population dynamics of the species.

Habitats

The Glanville Fritillary occurs in two broad habitats, coastal grassland, where colonies tend to be permanent, and the south facing chalk downland in west Wight where colonies tend to be short lived though occasionally quite large. On coastal grassland it occurs in three distinct zones, within which the butterfly has different population characteristics. With the exception of a single site near Ventnor (which is lightly cattle grazed), none of these coastal sites are grazed by stock, although rabbit grazing is locally significant.

1) The undercliff

The habitat here results from continuous soil slippage and slumping on the Wealden (Gault) clays and populations can be large or small depending on the amount of bare ground and young plantains present. If slopes become too stable, and succession proceeds to dense grassland or scrub, the populations decline to extinction.

2) the ‘chines’

Leading from the coast are small incised riverine valleys called ‘chines’. At the coastal end of these valleys are areas of slippage that contain persistent populations (sometimes quite large) of the Glanville Fritillary.

3) the cliff tops

The cliff tops have short, somewhat more stable vegetation which can be used for breeding. Populations tend to be comparatively small and susceptible to frequent extinction and re-colonisation. Most are extensions from adjoining chines and undercliffs; very few are likely to represent distinct populations, but they are important supplements and probably help link the main populations. This zone is very narrow as arable fields go close to the cliff edge, but

has potential for conservation management as the field boundaries could be moved further away from the cliff edge.

All three zones are susceptible to drought, especially zones 1 and 3. This can have a major impact on the succession and may encourage the drought resistant *Plantago lanceolata*.

2.3 DISTRIBUTION AND POPULATION

Distribution

The Glanville Fritillary has a palaearctic distribution occurring from north-western Africa and Spain, through central and northern Europe to 61°N in Scandinavia and through to Asia. It is widely distributed and locally common in Europe, occurring in meadows from sea-level up to 2000m (Emmet, 1990).

In Britain, the butterfly is restricted to the south coast of the Isle of Wight, although since 1990 there has been a mainland site on the Hampshire coast, (this coast is intermittently occupied). Whether this or other short lived colonies on the mainland are the result of natural colonisation or unauthorised introductions is not known. The Glanville Fritillary was (without prior authorisation) introduced to a limestone promontory in Somerset in 1983. The population is very small (3 to 12 webs counted annually between 1993 and 1997) and drought appears to be an important factor in regulating the habitat (Oates, 1995, pers comm.). There is probably no colonial butterfly in Britain (except perhaps the Marsh Fritillary) that is more subject to captive rearing and release (M. Oates, pers. comm.). Introduced populations typically fail, with only two examples surviving greater than 10 years (Oates and Warren, 1990).

Historically there are a scattering of records which are generally accepted as authentic (Emmet, 1990). They include the original site where the species was first collected for Lady Glanville, in Lincolnshire (Petiver, 1703; Ray, 1710), and records from a site that must have been near London (Harris, 1766). These records appear to have been from sheltered open woodlands rather than cliffs (Emmett, 1990). However, by the middle of the 19th century the Glanville Fritillary was known only from the Isle of Wight and the coast of Kent between Folkestone and Sandwich. It became extinct in Kent by the mid 1860s, but reasons for these losses have not been examined.

Population

The Glanville Fritillary is a colonial species, occurring in discrete habitat patches. However it is more mobile than many butterflies, and is periodically seen several kilometres away from its known breeding sites. Occasionally, these larger scale movements result in colonies being established on the central chalk of the Isle of Wight, or even the mainland, but these have so far been short lived. The species recently colonised a site on the mainland, discovered in 1991. It is assumed that the colony established in 1989, a good year for the species when several adults were seen away from the main colonies. However, given the record of releases for this species it is impossible to rule out a deliberate release onto this site.

The location of breeding areas also tends to shift in response to continual land slippage and erosion. On occasion these slips occur spectacularly over large areas at once, while others are more gradual slips, where the ground is criss-crossed with small cracks exposing bare soil and an uneven terrain. These early successional sites begin to become unsuitable unless further slippage occurs. Simcox and Thomas (1980) estimate that the habitat becomes suitable a year after a slippage, improves for the next 2 to 3 years, and thereafter deteriorates at a varying rate, depending on particular site characteristics. On the slopes of the chines soil slippage continues to keep areas in a suitable condition, with some trampling by tourists keeping the turf short and increasing the necessary erosion (Simcox and Thomas, 1980).

The population structure of the Glanville Fritillary shows classic features associated with both a standard metapopulation* (Levins, 1970) where site suitability changes periodically, ensuring populations are subject to local extinctions and colonisations; and more commonly, the source/sink or 'mainland-island' structured metapopulation of Harrison et al. (1988), whereby key areas are relatively persistent and provide a source population for small, short-lived colonies nearby. These short-lived colonies include those that establish on the central chalk of the island, and the very small colonies that establish on the very narrow grassland strip at the top of the cliffs. Despite their small size, these colonies may play a central role in allowing populations of the Glanville Fritillary to move around the main under cliff sites (D. Simcox, pers. comm.). The Glanville Fritillary has also been used in extensive studies of metapopulations on islands in Finland. Work that predicts that the Isle of Wight populations are small and more vulnerable than previously realised (Hanski et al., 1994).

Most Isle of Wight colonies have been monitored by volunteers annually since 1983 through counts of larvae (using the methods of Thomas and Simcox, 1982) (Pope, 1988, and 1988-1995) and adults are counted at several colonies by National Trust wardens. Populations of the Glanville Fritillary are known to fluctuate widely, and for example were quite low at the beginning of the century but built up in the 1920s. Numbers were also very high in the late 1940s and in recent years populations have been quite high following lows in the early 1990s. Accurate assessments of population size were made in 1979 (Simcox and Thomas, 1980) which demonstrated that the south west of the southern coast of the Isle of Wight was the stronghold for the species. Populations contained between 1 and 1000 larval nests with an estimated 12 colonies (counts greater than 50) not dependent on continual immigration from source populations to maintain numbers. Of these 12 colonies only one, at Redcliff is in the east of the island and therefore quite isolated, being separated from the main area by approximately 10 miles of coastline.

The metapopulation structure is such that it is easy to overestimate the status of the Glanville Fritillary unless full surveys are done in most years. Current evidence suggests that there are as few as 5 to 8 core populations which persist through troughs of abundance, which makes it a very vulnerable species (J. A. Thomas and C. Pope, pers. comm.).

* A metapopulation is a collection of local populations, connected by occasional dispersal, in which there are local extinctions and colonisations (Gilpin & Hanski, 1991).

2.4 LIMITING FACTORS

Historical

There has been little change in the known distribution of the Glanville Fritillary on the Isle of Wight, although some sites have been lost, for example Binnel Bay, due to a lack of grazing and cliff stabilisation. However it is no longer found at its original location in Lincolnshire or in Kent, where there was a cluster of records in the mid 19th century. The reasons for this loss have not been examined.

Current and Future Limiting Factors

The main limiting factors of the Glanville Fritillary are probably climatic and its specialised habitat requirements.

Coastal protection works threaten some sites by stabilising the cliffs preventing the slippage which creates the early successional habitat.

Development, particularly of sites for tourism threatens some sites.

An increase in rabbit grazing, threatens a few sites.

Drought can seriously effect populations causing local extinctions.

The species is probably more vulnerable than had been previously realised due to its metapopulation structure. It is essential that the full complement of potential sites is maintained on the Isle of Wight, both occupied and unoccupied sites.

2.5 RESUME OF CONSERVATION TO DATE

Ecology and Conservation Requirements

The Glanville Fritillary has been well studied in the past and its ecological requirements are quite well known. Most populations are monitored annually. The species is well represented on protected areas, with the majority of core colonies owned by the National Trust (Oates, 1995). However, the majority of sites are privately owned. Conservation effort other than monitoring has included the occasional reintroduction such as that at Bonchurch, Isle of Wight, in 1988. One inland site, at Mottistone Down, established c. 1989 following the swiping of gorse and bramble continues to be managed, however this population has declined despite the continuation of similar management.

Current Studies

Volunteers and National Trust wardens continue to monitor most sites. Further research work by J.A. Thomas and D. J. Simcox was undertaken in 1996 and is ongoing.

Part 3 Actions and Work Programme

This section has been divided into the standard headings Policy and Legislative; Site Safeguard and Acquisition; Land Management; Species Protection and Licensing; Advisory; International; Future Research and Monitoring; Communications and Publicity; Review. Actions are given a low, medium or high priority. The lead organisation(s) concerned for each action is/are named.

Definition of Colony Size: Large = >1,000 adults; medium = 100-1,000 adults.
For key to abbreviations see page 12.

3.1 POLICY AND LEGISLATIVE

	Lead organisation(s) concerned
Action 1 PRIORITY: HIGH	
Continue to develop coastal policies that allow natural erosion to continue with minimal need for coastal defences in range of the Glanville Fritillary.	**EA, IoWC, NT.**
Action 2 PRIORITY: HIGH	
Include options for pulling back fence lines from cliff edges in Agri-environment schemes such as Countryside Stewardship.	**MAFF, IoWC.**

3.2 SITE SAFEGUARD AND ACQUISITION

Action 3 PRIORITY: HIGH	
Protect all key areas not in conservation ownership and maintain as networks of breeding habitats throughout existing range.	**NT, EN, IoWC etc.**
Action 4 PRIORITY: HIGH	
Ensure development proposals do not adversely affect existing or potential habitats, including development that might require future coastal defences, or cliff stabilisation (i.e. developments on or near cliff tops including road schemes).	**All**

3.3 LAND MANAGEMENT

Action 5 PRIORITY: HIGH

Promote beneficial grassland management in existing and potential breeding habitat on the undercliff, particularly the control of rabbit (where numbers are high) and gorse (see details in Appendix 2).	**BC, NT, EN, IoWC**

Action 6 PRIORITY: MEDIUM

Promote beneficial grassland management in areas of the central chalk of the Isle of Wight when populations establish (see Appendix 2).	**BC, NT, EN, IoWC**

3.4 SPECIES PROTECTION AND LICENSING

No action proposed, (NB most colonies occur on National Trust land, which is covered by National Trust bye laws).

3.5 ADVISORY

Action 7 PRIORITY: HIGH

Advise conservation agencies and site owner/managers on requirements of the Glanville Fritillary to ensure all known and potential habitats are protected.	**BC, NT, ITE, EN**

Action 8 PRIORITY: MEDIUM

Encourage appreciation of the metapopulation structure of the Glanville Fritillary and the importance of areas within its range not presently occupied by the butterfly.	**BC, EN, ITE, Hants & IoWT, IoWC**

Action 9 PRIORITY: MEDIUM

Discourage the practice of unauthorised introductions and promote Butterfly Conservation's code of practice on introductions.	**All**

3.6 INTERNATIONAL

No action proposed

3.7 FUTURE RESEARCH, SURVEY AND MONITORING

Action 10 PRIORITY: HIGH

Continue to collect data annually on adults and larvae, compare trends on individual sites, and disseminate the results.	**IoWNH&AS, BC, EN,NT.**

Action 11 PRIORITY: HIGH

Examine metapopulation structure and vulnerability of existing populations, particularly the role of habitat quality and availability, and the role of parasitoids.	**ITE**

Action 12 PRIORITY: LOW

Study potential impact of climate change and examine feasibility of encouraging restoration on the mainland, where there is potential for re-establishing viable networks of populations.	**ITE**

Action 13 PRIORITY: MEDIUM

Study ways of improving habitat quality and impact of rabbit grazing.	**ITE, NT, IoWNH&AS, BC**

3.8 COMMUNICATIONS AND PUBLICITY

Action 13 PRIORITY: HIGH

Publicise this Action Plan, the status of the Glanville Fritillary and the measures being taken to conserve it.	**BC, EN**

3.9 REVIEW

Action 14 PRIORITY: HIGH

Monitor this Action Plan annually and update every five years as necessary.	**BC, EN, etc.**

Key to abbreviations
All = All organisations listed
BC = Butterfly Conservation
EA = Environment Agency
EN = English Nature
Hants & IoWT = Hampshire & Isle of Wight Wildlife Trust
ITE= Institute of Terrestrial Ecology
IoWC = Isle of Wight Council
IoWNH&AS = Isle of Wight Natural History and Archaeological Society
MAFF = Ministry of Agriculture, Fisheries and Food
NT = National Trust

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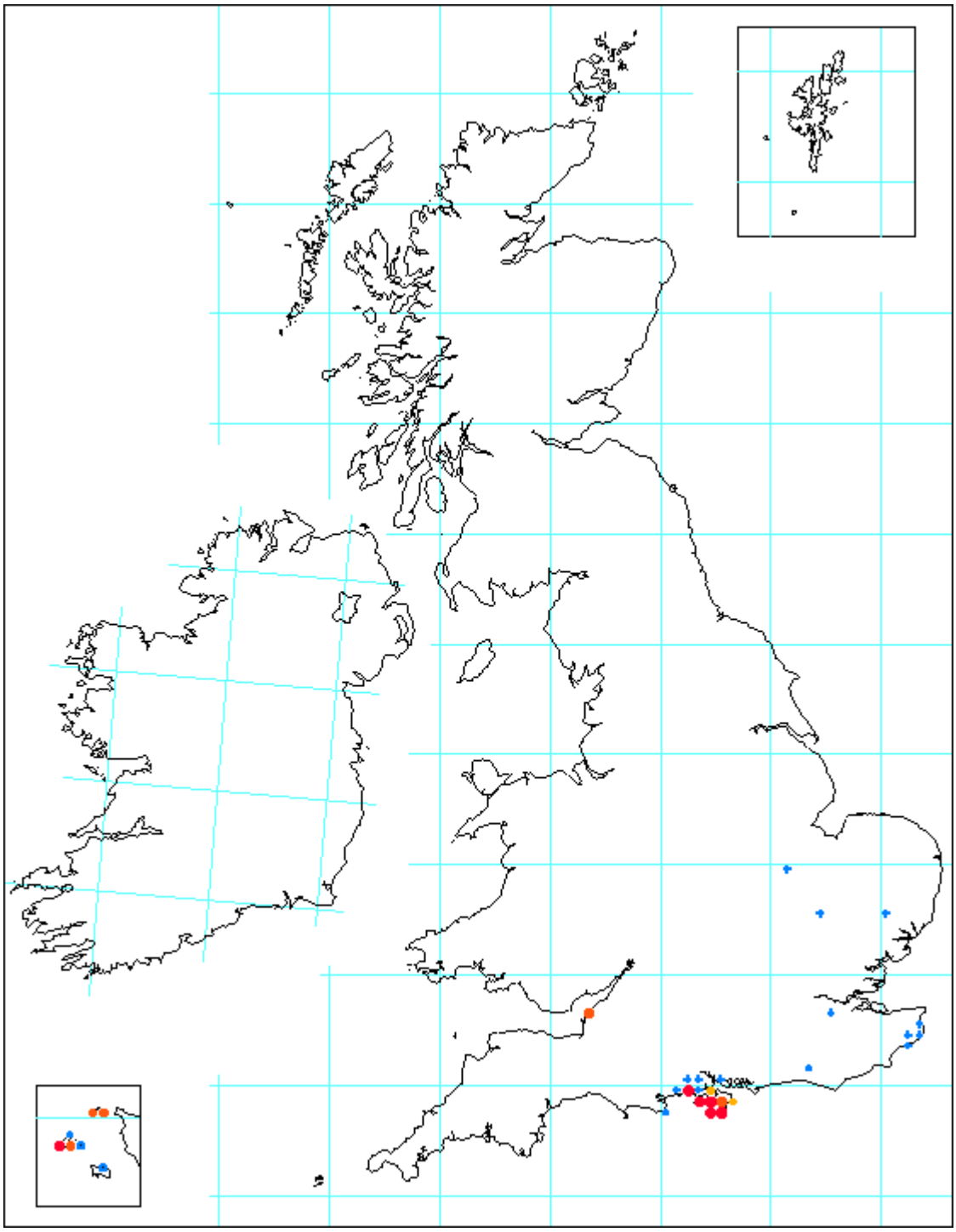
Appendix 1 The approximate distribution of the Glanville Fritillary

Butterflies for the New Millennium project (2001).
Copyright of Butterfly Conservation/Biological Records Centre.
(Dark full spot all records from 1995-1999; open circles all records between 1970-1982; cross all pre 1970 records).



Appendix 2 Conservation requirements of the Glanville Fritillary

The Glanville Fritillary breeds in undercliff grassland, maintained by natural erosion and soil slippage, and adjacent cliff top grassland on the south coast of the Isle of Wight. Its main larval foodplant is Ribwort Plantain, *Plantago lanceolata*, but only small plants growing in abundance in very warm situations, on south facing slopes, are used for breeding. Females therefore select small plants growing in short sheltered vegetation which often contains some bare ground.

Suitable conditions are only maintained on a sufficiently large scale by continuous soil slippage on coastal sites. Sites remain suitable for 2-5 years after a slippage and become unsuitable rapidly when the vegetation stabilises. Management for this species therefore relies primarily on ensuring that natural coastal erosion continues, thereby creating a regular supply of early successional vegetation. At present it seems that the south coast of the Isle of Wight is the main area which will provide continuously suitable breeding habitat in the long term.

On inland sites, certain cutting and grazing regimes, probably combined with drought effects, may provide marginal habitat and prolong the life of temporary colonies. However, it is not recommended that the requirements of the Glanville Fritillary influence the long term management of these marginal sites.

Little practical management can be done on undercliff sites once they become unsuitable following natural stabilisation, but if sites are isolated from other colonies, earth moving may become necessary in a very few cases. The habitat could be extended usefully on many cliff top sites by moving fence lines back from the cliff edge and allowing natural reversion to grassland.

Heavy rabbit grazing can be very detrimental to the Glanville Fritillary and control measures may be necessary to avoid damage to breeding habitats.