Marsh fritillary

1. A Definition

The marsh fritillary (*Eurodryas aurinia*) is a beautiful and distinctively marked species of butterfly. The upper side is reddish-orange with yellow-ochre patches and brown veins and cross-bars. The underside is considerably duller. Average wingspan is about 45 mm.

The marsh fritillary in Devon is a butterfly of unimproved damp, neutral or acid grasslands, found on the Rhôs pastures of the Culm Measures and Dartmoor and the spring line mires of the Blackdown Hills.

It is dependent on devil's bit scabious as the larval food plant, on very open un-shaded sites. The female requires larger plants where the turf height is 8-20 cm on which to lay eggs. Grazing is crucial to the success of a marsh fritillary colony, with cattle or horses creating the most suitable sward.

The single flight period is between May and July, with a concentrated emergence in late May to mid June.

2. Why an Action Plan?

The UK is a major European stronghold of this threatened species. Devon holds 20% of the known UK colonies (1998 figure) and therefore we in the County have national obligation to ensure the conservation of this butterfly.

The marsh fritillary was once widely distributed throughout the UK but has declined substantially over the last 150 years. It has recently died out over most of eastern England and eastern Scotland. Despite a quite widespread distribution in south west England colonies are estimated to be disappearing at more than 10% a decade.

The main threats to the species come from changes in traditional grassland management and the fragmentation of sites. Marsh fritillaries are thought to have a "metapopulation" structure, where colonies experience local extinctions and colonisations, so a viable matrix of suitable habitats is vital to their survival.

3. Relevant ecology

Marsh fritillaries in Devon occupy a specific habitat type: damp, neutral or acidic grassland. This is usually dominated by tussock forming grasses such as purple moor grass on more acid soils or tufted hair grass on more neutral soils. Breeding areas are generally very open and un-shaded, though may be sheltered by scattered scrub or adjacent woodland. Devil's bit scabious is the main larval food plant.

The butterfly has one flight period, between May and mid-July. The first egg batch is large with about 300 eggs, successive ones smaller. Females lay their eggs on larger devil's bit scabious plants typically growing where the turf height is 8-20 cm (Warren, 1994). Susceptible to grazing pressure, most colonies occur where there is light, often extensive cattle or horse grazing, or where grazing has been recently abandoned. Sheep grazed sites rarely support colonies as sheep will preferentially graze the food plant, leaving it too small for egg laying.

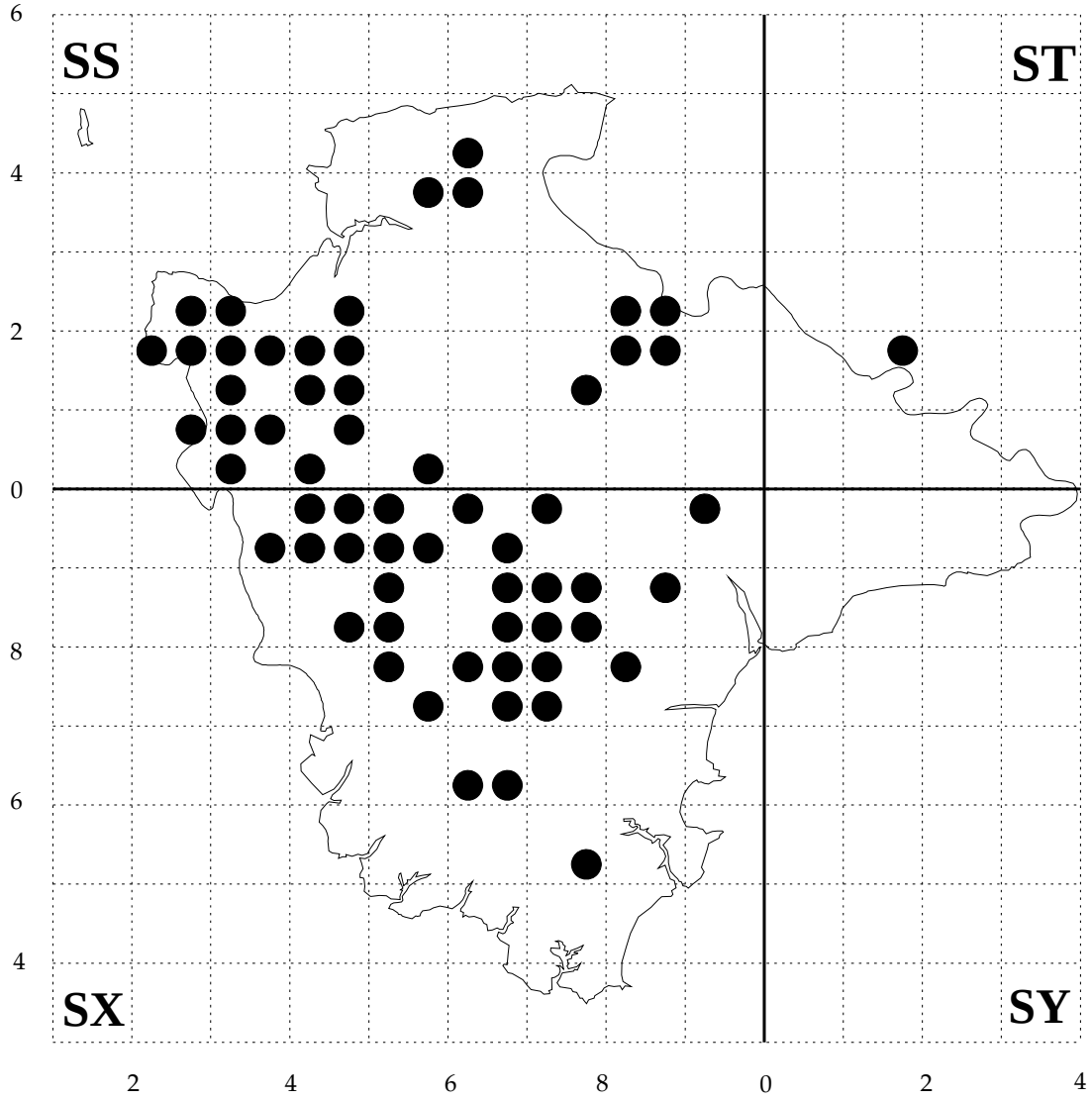
Young larvae spend their time feeding within a communal web. They over-winter in their fourth instar (larva stage) in a small hibernaculum which is usually found within 2-3 cm of the ground. Larvae emerge in late winter or early spring to bask communally on warm days. After dispersal from the communal group they eventually pupate close to the ground under dead leaves or on plant stems.

Emergence of the adults usually starts at the end of May or early June, although this varies each year. The males can emerge several days before the females, remaining on site for 4-9 days and the females for 3-6 (Warren 1992, Fowles 1984, Emmet and Heath 1990). Although many individuals are highly sedentary, there is some dispersal from colonies and some are seen in non-breeding habitats near to existing colonies (Warren 1994).

Populations fluctuate tremendously in size from year to year. Between 1982-85 there seems to have been an expansion with comparatively mobile populations. It is possible that in lean years they contract to core sites during sequences of poor seasons. The fluctuations seem to depend on weather, food supply and the proportion of caterpillars killed by the parasitic braconid wasp *Cotesia*. Warm but relatively sunless spring weather may lead to higher larval deaths by the parasites which can fit in three generations to the butterfly's one. It is also thought that the parasitoid may control the size of marsh fritillary colonies, preventing them from outstripping the supply of food plant. As an integral element of the butterfly's ecology they are of significant conservation value themselves.

The large fluctuations in the populations can cause problems where habitats are small or fragmented. Periodic extinctions of isolated colonies can give the appearance that colonies are shifting, either around fields or between groups of sites. But this is more probably caused by local extinctions and periodic colonisations. With these limited emigrations and movements the butterfly and the parasite *Cotesia* may be adapted to a metapopulation structure, which possibly also helps keep the parasite in check (Warren 1994). It is therefore vital to maintain colonies or metapopulations that are centred on relatively large areas or viable mosaics of suitable (but sometimes unoccupied) habitat so that the process of dispersal at times of high populations compensates for local extinctions.

4. Distribution of marsh fritillary in Devon (1998)



● Marsh Fritillary presence in 5 Km squares

(Data supplied by Butterfly Conservation)

5. Current population (1998)

In Devon: Devon is a national stronghold for this species with about 85 of the 432 confirmed colonies in the UK, 25% of which are within SSSIs. Recent botanical surveys and management agreement visits on Dartmoor have led to many new colonies being discovered, raising the total known within the National Park in 1997 to 44.

Elsewhere in the UK: In 1990 a survey confirmed 228 colonies in England, 111 in Wales, 35 in Scotland and 58 in Northern Ireland. 44% of known colonies were within SSSIs and 11 within NNRs. Almost half the colonies occupy very small patches of habitat, typically less than 2 hectares. Well over

10% of colonies are lost each year, although they are known to undergo large

fluctuations in numbers and success.

6. Current problems for marsh fritillary in Devon (1998)

Destruction of habitat: Agricultural improvement and development pressures have led to losses of important habitat within the crucial matrix of suitable sites upon which this species depends. It is likely that the butterfly was formerly found on marshy grasslands in parts of the county other than the Rhôs pastures of the Culm Measures and Dartmoor and the spring line mires of the Blackdown Hills before agricultural land drainage.

Inappropriate grassland management: Changes in stock breeds and grazing practice lead to scrub invasion and secondary woodland. Most colonies are found where light cattle or horse grazing occurs or where grazing has recently been abandoned. In general a long period of light grazing is better than short periods of heavy grazing, with a general aim to produce a sward where a reasonable proportion is within 10-15 cm height range on damp grasslands. The maximum grazing level tolerated is 0.4-0.7 livestock units/hectare (30-50 store cattle weeks or 20-30 suckler cow weeks/hectare/year), although on many Culm sites where productivity is low, ideal grazing levels are probably lower. More flexible grazing conditions are apparently tolerated on Dartmoor.

Increased fragmentation and isolation of habitats: In Britain most colonies (47% in 1983) occupy small patches of habitat typically less than 2 hectares. Only 15% occupy patches greater than 10 hectares (Warren, 1994). Co-ordinated management of networks of habitats within 5-10km (dispersal distance) is required.

7. Recent changes in population (1998)

The picture is one of losses of colonies where suitable habitat is lost, but also of continuing finds of new colonies as surveys, for example within Dartmoor National Park, identify new sites.

Marsh fritillary populations are liable to fluctuation depending on many environmental factors as well as their dependence on suitable management, so in a sense there is no such thing as population stability.

8. Current protection

- Annex II of the EC Habitats Directive.
- Appendix II of the Bern Convention.
- Schedule 5 of the WCA 1981 (full protection).

9. Biodiversity planning context

National BAP Context

Species of principal importance in England (NERC Act, S.41):

- Marsh fritillary

Current national BAP targets can be viewed on the Biodiversity Action Reporting System (BARS).

Associated Action Plans within the Devon BAP:

- Rhôs pasture
- Rivers, streams, floodplains and fluvial processes
- Barn owl
- Curlew

10. Biodiversity objectives and targets for marsh fritillary in Devon

Objective 1

Maintain range and number of colonies Devon.

Target:

- Enter existing suitable sites or potential habitat near occupied sites within the three key areas into appropriate protective management schemes to ensure no net loss of colonies. Ongoing.

Objective 2

Maintain and restore populations within the priority areas of West Devon Culm grasslands, Dartmoor Rhôs pastures and the Blackdown Hills.

Target: a minimum of five large populations (1000+ adults) in each priority area by 2015.

Objective 3

Encourage restoration of suitable habitat around or near occupied sites with large populations within the three priority areas in Devon.

Targets:

- Establish a restoration strategy identifying priority areas for habitat management in each area by 2008.

Note: such a strategy may well be covered by other management plans for these three key areas of Devon, but this should be explicit.

Objective 4

Foster greater understanding and awareness of the marsh fritillary, its requirements and effective management techniques.

Target:

- Ongoing.

11. Wider benefits from pursuing these objectives

The pursuit of the objectives and targets set out above will not only benefit the marsh fritillary. Conservation has wider benefits and advantages for society, by providing a resource which is the basis of many aspects of the local economy, and by adding to the quality of life of the people of Devon in ways which are beyond financial measure. Thus enhancing the interests of biodiversity also enhances the interests of society as a whole. Some of these wider benefits are as follows:

- Promotion of traditional grassland management practices, and benefit to nesting birds dependent on this. As well as the benefits to wildlife there are green tourism opportunities in pursuing these farming practices.

- Benefits to other invertebrates such as the narrow-bordered bee hawk-moth and the rare parasitic wasp *Cotesia*, and herbs dependent on low turf height.

- Awareness and education opportunities in studying a species with such particular habitat requirements and ecology.

12. Priority or indicative actions for marsh fritillary

in Devon

Action	Key Partners
1. Support and promote appropriate land management on occupied sites and those within dispersal range of existing populations through management agreements, agri-environment schemes, planning strategy work and development control.	DEFRA; DNPA; LAs; EN; DWT; FWAG
2. Survey and monitor known existing populations including metapopulations and associated *Cotesia* populations in the 3 key areas.	BC; EN; DWT
3. Ensure survey and monitoring data is sent to JNCC and the DBRC, and is widely available.	BC; EN; DWT; DBRC
4. Ensure that planning authorities, and advisory & regulatory agencies are aware of Marsh Fritillary colonies (and the importance of maintaining the integrity of the metapopulation) to help ensure development schemes, farming practices and afforestation do not adversely affect populations.	EN; BC; LAs; FWAG; DWT; FA
5. Promote the designation of all sites containing marsh fritillary as County Wildlife Sites as appropriate.	DWT; EN; DBRC; LAs; EA
6. Promote Marsh Fritillary and its habitat management and status through leaflets, training and advisory work.	BC; EN; DWT; FWAG

Marsh Fritillary Action Plan Champion - Butterfly Conservation

Abbreviations used in text and table

BAP	Biodiversity Action Plan
BC	Butterfly Conservation
CWS	County Wildlife Site
DBRC	Devon Biodiversity Records Centre
DEFRA	Department of Environment, Food and Rural Affairs
DNPA	Dartmoor National Park Authority
DWT	Devon Wildlife Trust
EN	English Nature
FA	Forestry Authority
FWAG	Farming and Wildlife Advisory Group
LAs	Local Authorities

Definitions

Colony A group of individuals (recorded as adults or groups of larval nests) that occupies a discrete patch of habitat and is separated from other groups by at least 0.5km of unsuitable habitat which probably restricts the free exchange of individuals.

Metapopulation Collection of local populations, connected by occasional dispersal, in which there are local extinctions and colonisations.

Population
Small = peak population <100 adults
Medium = 100-1000 adults
Large = 1000+ adults

Priority Areas Target areas where clusters of sites exist or with extensive potential

habitat and where long term conservation would be most effective.

*BC kindly allowed extracts from their Species Action Plan (1995) to be used.