How to identify suitable Bracken habitats for Fritillaries

On some sites all four Fritillaries may be found, however, their breeding requirements are subtly different and females will choose different places within a site to lay their eggs.

- Concentrate searches on sheltered, south-facing Bracken stands, with abundant violets and below 300m, as these are most likely to support Fritillaries. Search for key areas in spring before the Bracken fronds have unfurled.
- Pearl-bordered Fritillary and High Brown Fritillary breeding areas are characterised by violets growing through a shallow (<15cm) layer of Bracken litter and standing trash. The mosaics used are typically one-third grass to two-thirds Bracken.
- Areas suitable for the Small Pearl-bordered Fritillary are usually damper; often wet flushes, with abundant Marsh Violet growing amongst Purple Moor-Grass and/or Tufted Hair Grass.
- The Dark Green Fritillary uses violets within Bracken mosaics frequently consisting of one-third Bracken and two-thirds grass, often on the edges of suitable High Brown Fritillary habitat.
- Caterpillar feeding damage can be found when looking closely at violet plants growing in the conditions already described. If the damage is round and smooth then it has probably been caused by a Fritillary caterpillar, if it is torn and jagged then it is more likely to be from slugs and snails.
- Return to key areas at least three times during the spring and summer when adult Fritillaries are likely to be in flight. Best times are late April-June (Pearl-bordered and Small Pearl-bordered) and June-July (High Brown and Dark Green).
- Useful places to look for Fritillaries are the adult feeding areas; Bugle, Bramble and thistle flowers are favourite nectar sources.

c0853 January 2005

Further help

Under Defra's Environmental Stewardship Scheme, administered by the Rural Development Service, there are financial incentives to manage Bracken habitats in a way that is sympathetic to the needs of Fritillaries and other wildlife. Visit **www.defra.gov.uk** for more details. The Heather and Grass burning Code can be found at **www.defra.gov.uk/corporate/rds/hgbc.pdf**

We would like to thank English Nature for their assistance in producing this leaflet.

Butterfly Conservation

Saving butterflies, moths and their habitats

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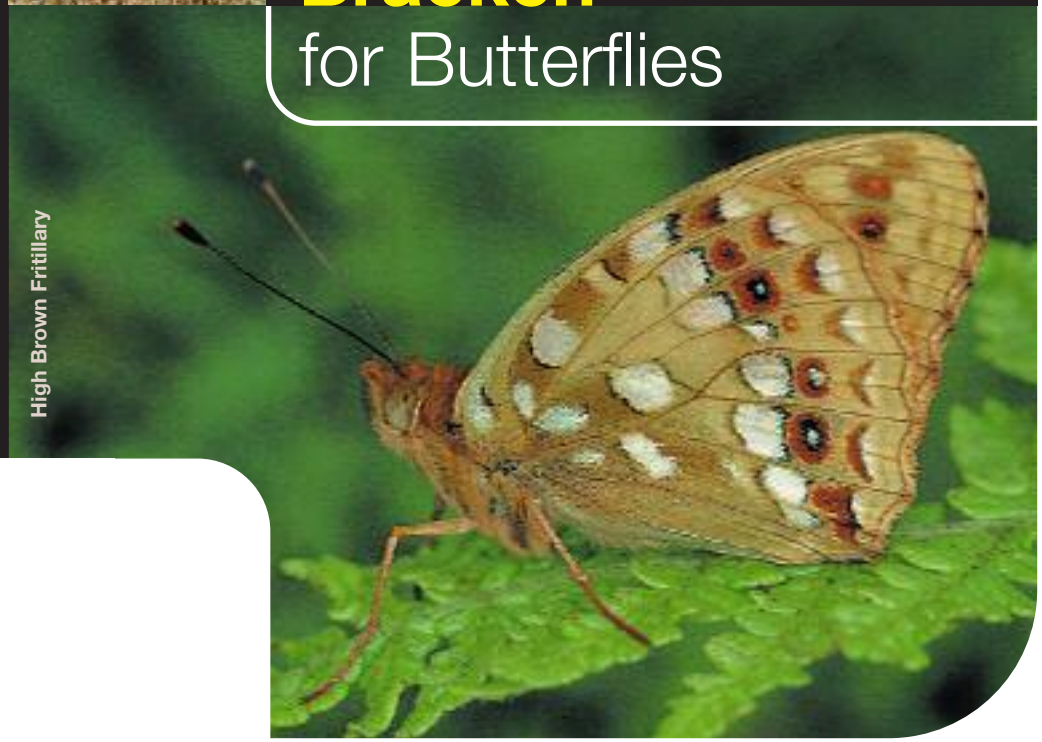
Butterfly Conservation

Bracken for Butterflies



High Brown Fritillary

Bracken helps some of Britain's most attractive and threatened butterfly species to survive

The presence of Bracken in lowland habitats ranging from open hillside to woodland (below 300m) is important for many forms of wildlife, but is especially vital to four, highly threatened Fritillary butterflies

Suitable breeding habitat consists of violets growing through dead Bracken and leaves in spring

Cattle grazing a Bracken slope in summer

Adult High Brown Fritillary

High Brown Fritillary caterpillar basking on dead Bracken

Suitable habitats for Fritillary species occur in sunny, sheltered situations often where there is a mix of grass, Bracken and scrub. The Bracken fronds act like a woodland canopy for the violet foodplants and dead Bracken provides a warm microclimate for the development of the immature stages. This leaflet gives simple information about these butterflies and how to identify and manage Bracken habitats in order to conserve them.

The High Brown Fritillary was once widespread in coppiced woodlands and grazed Bracken habitats. Its decline since the 1950s has been sudden and severe with an 82% loss over the last 20 years. The butterfly is now restricted to around 50 sites, principally on Dartmoor and the Morecambe Bay Limestones. Sadly, only a few colonies are still present in Wales and on the Malvern Hills.

Reasons for decline

The High Brown and Pearl-bordered Fritillaries are two of Britain's most rapidly declining butterflies. Many colonies have been lost due to changes in woodland management practice, such as the abandonment of coppicing, and these species have become increasingly restricted to areas of rough grassland and Bracken habitats. The Dark Green and Small Pearl-bordered Fritillaries also occur in Bracken mosaics although they breed in several other habitats. Many Fritillary colonies in Bracken habitats are under threat as a result of changes in management practices, usually from the decline or abandonment of grazing and occasionally due to overgrazing. Abandonment and under-grazing quickly leads to total domination by Bracken and loss of the associated flora on which Fritillaries and other insects depend. Overgrazing causes an increase in grass cover; which is particularly detrimental to the High Brown Fritillary.

Habitats

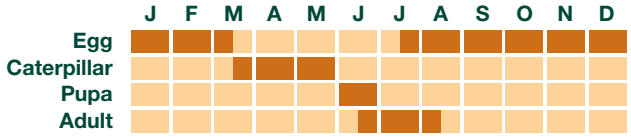
Bracken habitats suitable for Fritillary butterflies are those where the ground flora consists of a mixture of woodland plants (e.g. violets, Wood Anemone, Wood Sage, Bugle and Primrose) and acid grassland plants (e.g. Tormentil and Wavy Hair-grass). Bracken containing these plant communities can occur on hillsides, in woodland clearings or at woodland edges. Fritillaries are most commonly found when these communities occur on neutral to slightly acidic soils. Unsuitable Bracken habitats tend to occur on more acidic soils where violets are rare or absent, or in upland areas too exposed for butterflies.

Within Bracken stands, each Fritillary species occupies a distinct microhabitat that is thought to reflect the temperature requirements of the caterpillar. For example, High Brown and Pearl-bordered Fritillaries require Bracken on warm, dry slopes where the dark-coloured caterpillars bask on dead Bracken to raise their body temperatures enough to develop in the cool spring weather. In contrast, the Small Pearl-bordered and Dark Green Fritillary prefer more moist conditions where violet plants grow within grassier vegetation amongst Bracken or in gaps along Bracken edges.

The adult butterfly flies from mid-June to August. Individuals can move several kilometres between colonies and are often seen feeding on flowers some distance from breeding areas. Females lay their eggs singly on dead leaves or Bracken stems, substrates that are unlikely to rot down quickly as the eggs over winter. In early spring the caterpillars hatch and spend long periods of time basking on dead Bracken in short sparse vegetation, with bouts of feeding on Common Dog-violet (occasionally other species of violet are used). The temperatures in these microhabitats can be up to 15 to 20°C higher than in the surrounding grassy vegetation, allowing the caterpillar to develop quickly in the cool spring weather. The caterpillars are well camouflaged and have feathered brown spines that give them the appearance of dead Bracken fronds. They pupate under dead Bracken or leaves.

Adult female wingspan 6.2 - 7.5 cm

High Brown Fritillary life cycle



Dark green Fritillary

Underside of the
Dark green Fritillary,
note the olive-green colouration

Basking Pearl-bordered
Fritillary caterpillar

Underside of the Pearl-bordered Fritillary, note the two large pearls and the outer red chevrons

The Dark Green Fritillary is still one of our most widespread Fritillaries and is often found flying on the same sites as the High Brown Fritillary. However, despite its widespread nature it has declined by 55% in the last 20 years.

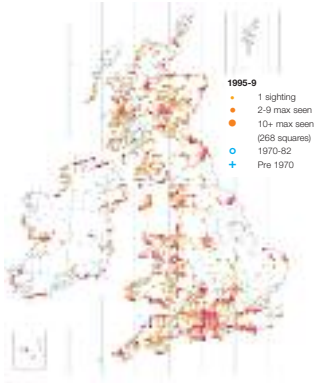
Basking Dark Green
Fritillary caterpillar

The Pearl-bordered Fritillary was once very widespread but has declined by 68% over the last 20 years, with losses especially severe in woodlands in the east and south of England and Wales.

Pearl-bordered Fritillary

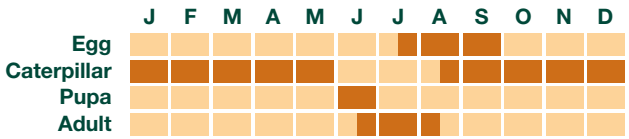
During June to August the adult can be seen flying in a range of open sunny habitats, not just Bracken sites. Eggs are laid singly on dead leaves or dead Bracken, but unlike the High Brown Fritillary, are also deposited on herbs or the violet host plants themselves (usually Common Dog-violet on Bracken sites). As the caterpillars hatch a few weeks after the eggs are laid, the actual substrate seems to be less crucial. Immediately after hatching the caterpillar enters hibernation amongst the dead grass or leaf litter. They begin feeding in spring, basking on the vegetation and feeding on young violet growth. This Fritillary can withstand relatively cooler conditions, using areas of Bracken with a greater proportion of grass and other vegetation.

Dark Green Fritillaries are very similar in appearance to High Brown Fritillaries and are often mistaken for them in flight. They are best differentiated by looking at the markings on the underside of the hind wing. The Dark Green has an olive-green colouration and lacks the row of red-ringed spots present on the High Brown. The Dark Green also has rounded, less pointed forewings whereas the High Brown has straight or concave outer edges to the forewings.

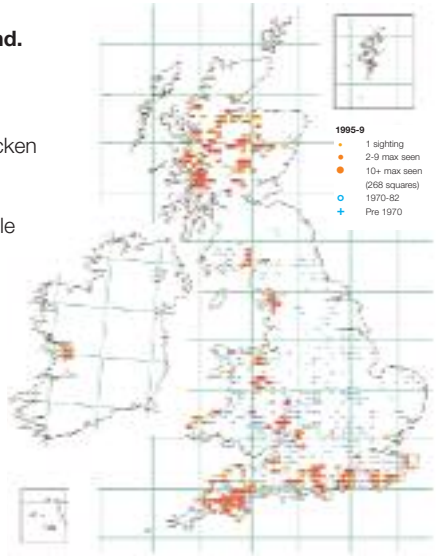


Adult female wingspan 5.6 - 6.8 cm

Dark Green Fritillary life cycle

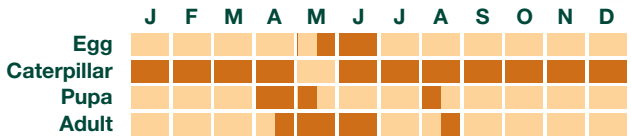


This is the earliest Fritillary to emerge and can be found during April on hot south-facing slopes in southern England. It flies in May further north and in Scotland. In very hot years, there is sometimes a partial second emergence during August. It flies low to the ground, stopping regularly to feed on spring flowers such as Bugle. Eggs are laid singly, usually on dead Bracken or leaves near to violets, though a few are laid on the food plant, Common Dog-violet. The caterpillars hibernate within Bracken fronds, or dead leaves of scrub and tree species such as Bramble or Oak. They emerge in early spring, selecting the warmest and driest habitats in which to bask, thus enabling them to develop rapidly in cool spring weather. In between bouts of basking, they spend short periods of time feeding on the leaves and flowers of violets.



Adult female wingspan 4.3 - 4.7 cm

Pearl-bordered Fritillary life cycle



Small Pearl-bordered Fritillary mating pair

Small Pearl-bordered Fritillary caterpillar feeding on violet

Small Pearl-bordered Fritillary

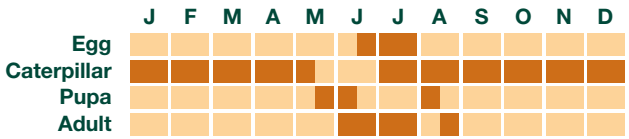
The Small Pearl-bordered Fritillary was once very widespread but has declined by 52% over the last 20 years. This species utilises grassland with Bracken and patches of scrub, woodland glades, damp grassland or moorland (western and northern Britain) and wood-pasture in Scotland.

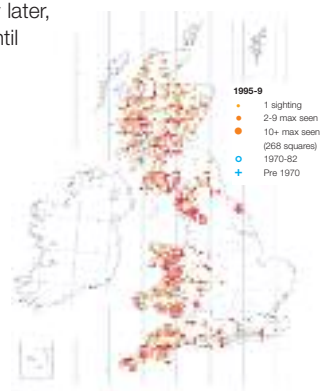
The female lays her eggs singly, either on dead vegetation near to violets or sometimes on the food plant itself. Occasionally she even drops them while crawling amongst low vegetation. On many sites the caterpillars feed almost exclusively on Marsh Violet. The caterpillars feed until around September when they hibernate, probably amongst the leaf litter. They emerge to feed again during spring but, unlike the Pearl-bordered Fritillary, they rarely bask and spend most of their time concealed amongst the vegetation, only coming out for short bouts of feeding. They pupate close to the ground, hidden deep within the vegetation.

The Small Pearl-bordered Fritillary is similar in size to the Pearl-bordered Fritillary, with which it is often confused, but is more widespread than the latter. They are easily distinguished by looking at the underside of the hind wing. The Small Pearl-bordered has a large central black dot on the underside along with numerous white 'pearls', with the outer 'pearls' bordered by black chevrons. In contrast, the Pearl-bordered has only two large silver 'pearls', its row of outer 'pearls' bordered by red chevrons and the central spot on the hind wing is also much smaller. Adults fly slightly later, from late May until the end of July.

Adult female wingspan 3.8 - 4.4 cm

Small Pearl-bordered Fritillary life cycle





Management advice

Aim to create and maintain mosaics of Bracken interspersed with grassy patches and canopy gaps, with abundant violets growing through Bracken litter and standing trash[1], where there is a limited cover of grass.

- **Extensive grazing** by cattle and ponies is ideal. The trampling action of the animals through Bracken stands, in particular during winter and early spring (usually February to April), is most important to help break up the dense standing trash. This creates a network of paths running through the Bracken, which provides germination sites for violets and opens up the Bracken canopy to allow sunlight in.
- Some sites may be maintained in suitable condition by sheep grazing, though these animals are not as effective at trampling Bracken and maintaining good densities of violets. Grazing by sheep between April and June should only be light and extensive as these animals can remove nectar sources used by adult butterflies.
- **Periodic cutting** can improve habitat conditions on un-grazed or lightly grazed sites where the Bracken is becoming dominant. Cutting should not be seen as a replacement for grazing, which appears to be the best way of maintaining good breeding habitat.
- If cutting is the only option, cut areas of Bracken (0.5 to 1ha) during late May or early June on a 3 to 10 year rotation, according to local site conditions but ensure no more than one-fifth of the breeding area is cut in any one year. Care must be taken in areas where ground-nesting birds occur. When cutting very dense stands a second cut in July/August may be necessary.
- Combine this with cutting of paths (0.5 to 1m widths) in June following different routes each year. Carry this out in June, immediately prior to the High Brown Fritillary adult flight period, thus enabling the females to easily locate suitable egg laying sites. A swipe cutter is preferable to cutting with a flail as the latter breaks up the Bracken stems too much and causes them to rot down too quickly. If bramble is a problem this should be controlled if it starts to encroach on the cut areas.
- Small-scale raking and disturbance of dense Bracken litter during autumn and winter may help to maintain high densities of violets.
- Cutting on a regular basis (i.e. annually or every other year) should be avoided as this creates a very grassy sward with no standing trash or Bracken litter, which is unsuitable for all four fritillary species.
- **Bracken-bruising** machines may also reduce Bracken densities. Bruising should take place during June when the Bracken stems are sufficiently hard not to snap off, with follow-ups in July and August for maximum control. This technique is best used to create patches or strips of bruised Bracken and to vary structure across a site especially on rocky and uneven ground where cutting is difficult or dangerous.
- **Bracken spraying** (e.g. with Asulox) may be a useful way of restoring sites with high Bracken densities and deep litter build-up. However, extensive Bracken spraying can be damaging to existing breeding habitat of Pearl-bordered and High Brown Fritillary as it severely reduces Bracken density and leads to an increase in grass cover. Low dosage spraying of patches or strips may help improve conditions where Bracken has become too dense and violets rare. It could also be used to create grassy patches amongst dense stands to provide some keep for livestock and encourage traffic of grazing animals through denser areas. Spot treatments can be used to control Bracken encroachment problems and to reduce frond density.
- **Controlled burning** may be helpful and can reduce Bracken litter and scrub and encourage violets, but only when subsequent management is planned as burning stimulates Bracken growth. Only burn on sites with a history of burning and burn in patches comprising less than one-fifth of the breeding habitat per year. Any burning undertaken must be in line with 'The Heather and Grass burning Code'.
- **Cut or burn scrub** on a 5-10 year rotation, which helps to maintain abundant violet growth in short, sparse vegetation. Suitable breeding conditions for Pearl-bordered Fritillary and Dark Green Fritillary may be provided around the edges of scrub patches, notably gorse.

[1] Litter refers to the broken down fragments of Bracken in contact with the soil surface. Standing trash refers to the dead, un-degraded remains of Bracken fronds and stalks still standing or lying on the ground.