



British Dragonfly Society

Habitat Management Fact File

The Brilliant Emerald *Somatochlora metallica* (Vander Linden)

Identification

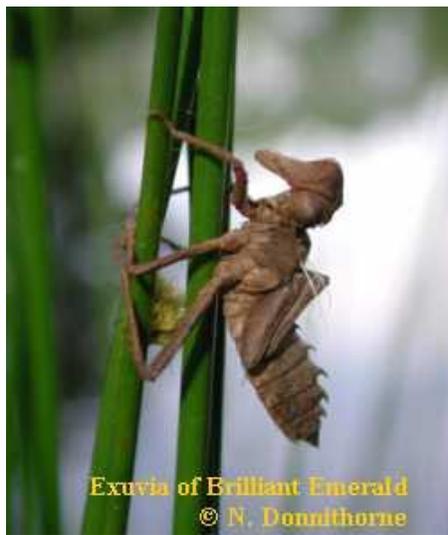


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The Brilliant Emerald *Somatochlora metallica* resembles, but is slightly larger than the other two British Emerald species *S. arctica* (Northern Emerald) and *Cordulia aenea** (Downy Emerald)^{1, 2}.

The Brilliant Emerald has apple green eyes and the abdomen and thorax are dark metallic emerald green with a bright bronze sheen. The wings are suffused by saffron, particularly in the female. In the male the abdomen is slightly club-shaped and is less hairy compared to that of the Downy Emerald¹. The abdomen of young specimens in particular will glint and flash in sunshine. There are also pale yellow markings laterally and ventrally on segments 2 and 3.

Females have two small yellow spots on the third segment, but the vulvar scale is the most distinctive feature as it is long, "acutely pointed and directed almost vertically downwards" from the base of the abdomen, and can often be seen in flight³. Both sexes have long anal appendages which may also be visible in flight.



Exuvia of Brilliant Emerald
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As its name suggests the Brilliant Emerald is more brilliant green compared to its European counterparts³. The pattern of yellow facial markings and the shape of the anal appendages are distinctive and diagnostic¹. Unless very good views are obtained, specimens should be netted and carefully examined in the hand to confirm identification². This is very important in areas where more than one Emerald species may be present.

The larvae and exuviae of Brilliant and Downy Emerald are remarkably similar in size and shape⁴. Therefore, a good field guide should be consulted to confirm identification^{5, 6}. A key distinguishing character is the large hook-shaped dorsal spines on the Brilliant Emerald, including on segment nine¹⁷. Downy Emerald has much smaller spines, and that on segment nine is very small or absent.

*Note: Although confusion may be possible as to the physical appearance of *Somatochlora metallica* and *Cordulia aenea*, behaviourally the two species are quite different; *C. aenea* generally patrols a regular beat close to the land perimeter whilst *S. metallica* flies much higher, away from the perimeter and often disappears for long periods¹⁸.

Status

The Brilliant Emerald is considered to be a nationally scarce species. Using the IUCN categories, which are based on occupancy of 10km-squares, fragmentation of habitat, numbers of localities and threats (known and predicted), the Brilliant Emerald is considered to be endangered in the UK.

Distribution

In Europe, the Brilliant Emerald occurs mainly in central and northern areas, and is restricted to higher altitudes in the south (e.g. Alps and Pyrenees). Its range extends eastwards to the Volga and Asia Minor³.

In Britain the species occurs in two distinct populations, one in the Highlands of Scotland and the other in southeast England. In Scotland the Brilliant Emerald is extremely local, centred on Glen Affric and Glen Mor, but the populations appear to be strong. There is also a population in Argyll, west of Loch Awe (now several lochs). By comparison the population in southeast England is much larger, including the wealds of Sussex and west Kent and the heaths of Surrey, north Hampshire and Berkshire¹. In these areas the dragonfly is locally common and appears to be extending its range².

[Distribution map](#) from the [National Biodiversity Network Gateway](#) website.

Ecology and Habitat Requirements

In southeast England, *Somatochlora metallica* is a lowland insect species, generally flying over open water, but sometimes hunting in light woodland where it may be found far from water³. The Brilliant Emerald breeds on mesotrophic, neutral to mildly acidic lakes and ponds. It also





occurs in a few slow-flowing rivers and canals: the Rivers Wey and Blackwater and the Basingstoke Canal. Both types of habitats need to have sheltered bays overhung with trees and bushes^{1,2}. Extensive emergent or floating vegetation may make the habitat unsuitable, as the amount of exposed water surface beneath the tree cover is reduced². In the high Weald of Sussex, the species is often found on old

hammer ponds that have been converted to coarse fisheries. Bankside trees are normally alder (providing dappled shade) backed by oak or beech woodland. Emergence sites are provided by clumps of pendulous sedge (*Carex pendula*). Water clarity varies from opaque brown on heavy clay sites to clear where thick leaf litter is present. Some parkland sites are also used where the aspect is more open and shade is provided by large mature trees¹⁹.



In Scotland, the smallest pools are generally avoided. Breeding lochs are situated in hollows. Nearby tree cover may also be important, but the need for extensive overhanging tree cover on margins is less apparent than in England. Some Scottish sites are in open moorland, and many contain extensive *Sphagnum* moss margins². Upland sites are at approx. 200-350m. What appears to be important is either overhanging banks or *Sphagnum* margins. Here the larvae have somewhere dark to hide, with well-aerated water.

In the Highlands of Scotland, territorial site preference for *S. metallica* appears to be linked to two types of microhabitats:

- Lochans with overhanging peaty banks covered with heathers, grasses, sedges and *Sphagnum*, backed at varying distances by conifers. There is a drop from the bank-edge to the water surface, and a similar depth of water beneath, leading to a fibrous detritus substrate. Close offshore, a sparse growth of emergent, submerged and floating-leaved vegetation tends to be found⁴.
- Lochans with *Sphagnum* lawn growing out from the bank margin, with a drop of 0.4 - 1.0m through the water below to detritus substrate⁴.

Overall in Scottish sites "*S. metallica* prefers natural still, well-aerated water with little vegetation and wide open water areas, steep or even undermined shores, bases covered with fine non-compacted mud and mesotrophic water"⁷. Woodlands seem to be a non-essential part of the Scottish habitats for the Brilliant Emerald. It breeds at sites without woodland in Argyll, but their value in the wind-swept landscapes is considerable. Conifer woods can also give an abundance of food for these flying insects⁴.

Although Hämäläinen & Huttunen⁸ believe the presence of breeding *Somatochlora metallica* is indicative of pH 5.1 - 5.8, the experience in Britain is rather different. In England, the species can be found in neutral to weakly acidic waters¹. At 14 breeding sites studied in the Sussex Weald, pH ranged from 6.9 - 7.7, whilst at two further sites, where the species was seen in cop, pH extremes of 5.4 and 8.5 were recorded¹⁹. In Scotland the pH factor seems irrelevant to occupation by *S. metallica*, with acidic waters in the Glen Affric area (pH 4.1 - 6.39) but neutral to only slightly acidic waters in the Loch Bran area⁴.

Feeding activity rarely takes place over water, and *S. metallica* has been seen hawking for prey along the tree-lined margins of valley bogs and over bracken on the edge of forest rides⁹.

Observations of the species in southeast England has allowed three types of flight to be differentiated amongst male *S. metallica*⁹:

- Flight searching for ovipositing females: 1m above water, near the edges, often hovering and flying in areas of shade beneath overhanging vegetation;
- General territorial behaviour: flying 2-3m above water, patrolling on a slow regular beat in the sunshine, further offshore;
- General reconnaissance flight: fast, irregular flight at varying heights above the water (exploring the suitability of new sites).

The species is very territorial and this may be a contributory factor to few individuals being seen together at each site.

Females spend more time foraging in the tree canopy and in clearings² and copulation takes place away from water, in trees or amongst bushes and scrub³.

The female oviposits alone, hovering over the selected place and repeatedly tapping her abdomen into wet *Sphagnum* moss or peat, in mats of floating vegetation very close to the bank, or directly into the shallow water amongst tree roots or common reeds. The female oviposits alone, hovering over the selected place and repeatedly tapping her abdomen into wet *Sphagnum* moss or peat, in mats of floating vegetation very close to the bank, or directly into the shallow water amongst tree roots or common reeds^{1,3,10}.

The female dips in the selected egg-laying area with her elongated vulvar scale, while her last two abdominal segments and anal appendages are held upwards, at right angles to the rest of the abdomen, allowing the eggs unrestricted access to the water³. The abdomen can be dipped 2 or 3 times per second into the *Sphagnum* moss¹¹. Females have also been observed where four or five presses into the moss were followed by a quick dip of the ovipositor into the loch, only 0.3 metres away¹².

S. metallica lays eggs in places where there is aquatic vegetation near the surface, to which the eggs adhere after sinking a short distance^{13,14} or sink into leaf litter near the edge of the bank. For Scottish sites, it is suggested that the following are requirements for oviposition:-

- A moist medium such as *Sphagnum* or wet peat at the edge of an overhanging bank or near the edge of a sphagnum lawn from where the prolarvae will be able to reach the water⁴.
- Depth of adjacent water between 0.5 - 1.0m or more, over a soft fibrous peaty substrate⁴.

The unaccompanied female may exhibit a marked tendency to oviposit at a time of day when few or no males are present. Some Corduliidae tend to oviposit in overcast conditions, or near dawn and dusk, and *S. metallica* can even oviposit in complete darkness^{14,15}.



Emerging female
with exuvia

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Larvae live amongst peat detritus, twigs, sticks and leaf litter, avoiding bare sand and gravel. Larvae are found under banks or stones; they like the dark and avoid the sunlight. They are commonest (on English sites) in parts that are heavily shaded by overhanging trees. They probably take at least two years to develop^{1,2}.

Changes of habitat can occur later in larval life. Up to the seventh instar, larvae of *S. metallica* stay mainly over muddy substrates, hide, move about and do not burrow. Subsequently their rate of metabolism falls and they can remain buried^{13,14}. In Scotland, larvae of all sizes have been found under overhanging banks, but not buried in substrate nor burrowing in peat but in sparse detritus¹⁷.

Adult emergence peaks in late June. Larvae emerge in the morning using bankside bushes and long

grasses, but exuviae are also found at up to 2m on tree trunks². Exuviae are often difficult to find. Teneral (immatures) of Brilliant Emerald disperse into the surrounding woodlands, returning as mature individuals just as the populations of Downy Emerald are declining².

S. metallica seems to have better dispersal instincts than *Cordulia aenea* (Downy Emerald) which has similar general habitat requirements.

Summary of main habitat requirements

- Habitats occupied by *S. metallica* in Scotland and in southeast England are only broadly similar: sheltered, standing or slow-flowing waters, usually but not always edged with good tree cover and/or surrounded by woodland¹⁶.
- Sparse emergent vegetation around the water margins, leaving a good surface of exposed water (especially under overhanging trees where there are some), sometimes with submerged vegetation close to the surface. However, the key is that larvae need a place to hide and ideally need the dark - i.e. shade provided by trees, overhanging banks, etc.
- Water bodies ideally but not exclusively need to have a soft peaty or muddy substrate, often overlaid with leaf litter. (NB: One site in Scotland is mainly stony with only small amount of peat, as are others abroad¹⁷)

Flight Period:

Early June to late August

Current Threats

- **Over management** - Expanding populations can be adversely affected by dredging and by excessive removal of bankside tree cover - a particular problem in waterbodies managed as fisheries, which support some of the strongest colonies. Dredging can be especially damaging for final instar larvae who bury in sediments.
- **Lack of appropriate management** - Loss of valley bog and wet heath habitats through natural succession caused by the growth of birch, pine and willow⁹ is undoubtedly impacting on Brilliant Emerald. As far as progression of vegetation is concerned, it can also be detrimental to let emergent vegetation get too dense under overhanging trees, as it reduces the amount of exposed water surface and affects the Brilliant Emerald's patrolling and ovipositing areas.
- **Deforestation** - The Scottish Highlands populations can be threatened by deforestation, leaving lochs and lochans too exposed for the adults, and also providing less feeding areas.

- **Reduction in water levels** - resulting from abstraction, diversion or drainage, is a serious threat to the survival of aquatic wildlife as a whole, and has been observed in several sites monitored for the Brilliant Emerald⁹.
- **Fish introduction** - The introduction of carp can have a detrimental impact on *S. metallica* and should be avoided in ponds and lakes where this dragonfly species occur. Carp are bottom feeders which up-root submerged aquatic plants. The use of a number of water bodies as coarse fisheries in the Weald of Sussex may be the explanation as to the relatively low populations of Brilliant Emerald.
- **Pollution** - Run-off from adjacent forestry land could have adverse impacts on the water quality of some ground-fed water bodies, affecting the dragonfly populations.

Management

General Management Guidelines

- **Survey Work** - Occupied sites should be thoroughly surveyed before work is undertaken, in order to establish what other species are present and adapt management options accordingly. All management works need to be undertaken sensitively. Mapping of emergence sites will often find that quite small areas of a site are very important and need to be carefully managed.
- **Maintaining water levels** - Any activity resulting in reduced water levels in ponds, lakes and lochs (e.g. abstraction, diversion or drainage) should be avoided.
- **General Habitat Management** - Each stage in the life cycle utilises the available habitat in different ways. Therefore, to conserve the species effectively this must be taken into consideration⁷.

Best Management Practice

- **Managing emergent vegetation** - Marginal emergent vegetation should be kept under control, especially under overhanging trees. The Brilliant Emerald cannot withstand dense cover of emergent and floating-leaved vegetation beneath marginal tree cover, as it reduces the amount of exposed water surface. A careful balance must be struck so that emergent vegetation does not disappear altogether, but thinning of dense beds of emergent vegetation can improve oviposition sites. Bankside vegetation can however be very important as emergence support and is best cut back after the end of the emergence period (late August).
- **Physical habitat management** - If pond dredging is essential, no more than a third of the pond bed containing leaf litter should be done at a time, using at least a three-year rotation to complete the whole surface area. It can be noted that areas of bare substrate (including sand and gravel) are unlikely to support *S. metallica* larvae and can be cleared without negative impacts on

this species. As noted above, mapping of exuviae, though difficult, will show which specific areas of a water body are important to larvae.

- **Pruning** - Where shading by bankside trees is becoming too intense, some pruning of overhanging branches should be considered so that patches of sun can reach the water surface. Ideally, rotation pruning should achieve a dappled shade effect on the margins of the water body.

Habitat creation and restoration

It is of utmost importance that potential pond sites are thoroughly assessed in order to avoid destroying other valuable habitats when creating a new wetland community.

Habitat creation in Scotland could be unpractical.

Habitat creation in SE England: - suitable habitats need to have a good cover of marginal trees and hence mature over a number of years before colonisation can take place. Habitat creation has been successful, with colonisation and breeding after three years, on a site having reached 50% tree cover¹⁹.

Habitat restoration needs to be done according to the management advice detailed above. Tree cutting and/or planting needs to be done sensitively so as to avoid over-exposing or over-shading the waterbody.

Case Study

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