

Overwintering

Conditions for moths in the British Isles in the winter are generally unfavourable; so most species resort to spending the winter in some state of hibernation or dormancy. The most significant problem with winter is the freezing temperatures that moths are subjected to, which in combination with high winds or heavy rainfall or both, has resulted in many moths needing physiological or behavioural adaptations to allow them to survive. The life-cycle stage that has to endure the winter differs between species.



Double Line larva, overwintering amongst vegetation – Graham Collins

Those that overwinter as eggs are usually either laid in summer or autumn and hatch in the spring, allowing them to take advantage of a plentiful food supply, or alternatively, they are laid in winter and the young caterpillars hatch as soon as deciduous trees come into leaf. Eggs that overwinter are normally laid in a sheltered location, tucked into tiny crevices, or most frequently, on the foliage of the foodplant, like the Brick *Agrochola circellaris* and the Sallow *Xanthia ictcritia*. Spending the winter as an egg confers some advantage, being that predation levels are low, but so are the food reserves of the egg. The problem with this strategy is that if the eggs hatch too early, the caterpillars are at risk of starvation. Too late, and there may be intense competition for food, or

the food may contain greater levels of chemical plant defences, making them less nutritious for the caterpillars. This risk may explain why relatively few species spend the winter as eggs.

A popular life-cycle stage in which to spend the winter is as a caterpillar, suggesting there may be some benefit in being able to move if necessary, or that there are some opportunities for, and advantages of feeding during mild spells in the winter. Some species actually overwinter within their food source; including the Welsh Clearwing, which feeds on the inner bark of old birch trees; and other stem and leaf-boring caterpillars. Many of these moths enter a period of diapause where their metabolic rate is decreased by cues such as temperature or day length, allowing them to conserve precious energy throughout the winter. Temperature cues can be somewhat unreliable, however, and if the larvae break diapause without enough food available, the caterpillars may starve.



Welsh Clearwing exit holes – Tom Prescott/Butterfly Conservation

One advantage of spending the winter as pupae is that the adult moths of some species can emerge in the spring when nectar sources are bountiful. Species that overwinter in this stage include all our resident Hawk-moths, which pupate

under the surface of the ground close to the foodplant, and others like the Emperor moth, whose pupa are spun on or amongst the vegetation. Pupae hidden under the surface of the soil also receive greater protection from predation and insulation against low winter temperatures.



Convolvulus Hawk-moth pupa – David Green/Butterfly Conservation

Species that spend the winter as adults, may exhibit one of three strategies in order to survive. Some microlepidoptera and geometrids emerge, mate, oviposit and die, all in the winter. Many of the females of the winter geometrids lack wings or have rudimentary wings. Other species, such as the Satellite *Eupsilia transversa* and the Chestnut *Conistra vaccinii*, emerge in the autumn and survive the winter as adults, feeding occasionally during mild spells, before reproducing in the spring.

And lastly a few species emerge in the autumn and mate with only the females surviving the winter in order to lay the

eggs in the spring, such as the Red-green carpet *Chloroclysta siterata*. Moths that do overwinter usually need to find somewhere cool and sheltered, like unheated outbuildings, caves or underneath cracks in tree bark, in which to survive the colder months and avoid predation.



Satellite – Paul Butter/Butterfly Conservation

Timing is a crucial factor in influencing the survival of newly emerged Lepidoptera but it may become even more critical in the future. There are some concerns that the advancement of spring which is evident in some temperate areas, sometimes by several days, caused by a warming of the climate, may in the future be detrimental to some species, that may be unable to adjust their time of emergence to coincide with the onset of spring. This could result in the moths being unable to find enough suitable food consequently threatening individual species.

References and further reading:

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