

Warming temperatures are leading to early emergences of smooth newts.



Female drone flies are among the first on the wing.



Listen for the soaring song of the skylark.



Some insects remain active through winter. Several moth species, such as the winter moth, can be seen even when it's near-freezing, as can lekking swarms of winter gnats.



Find overwintering insects under bark and beneath logs. You might see butterflies roosting in buildings; useful additional sites to tree holes and cave entrances.

TINY & WILD ROSS PIPER

Cool winter insects

Climate change is making winter tougher for our insects.

For insects, especially those that live on land, the colder months pose major challenges. On the whole, these animals cannot generate their own warmth, so their activity hinges on the ambient temperature. Also strong winds, lots of rain and less plant matter in autumn, winter and early spring are not exactly conducive to insect survival.

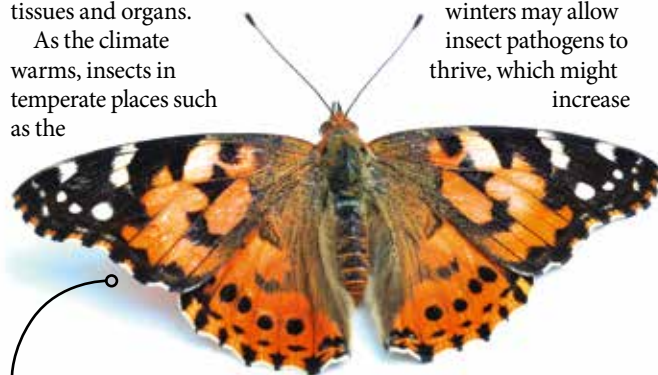
The only solutions to this problem are shelter, a long period of inactivity or migration. Depending on the species, insects can overwinter as eggs, larvae, pupae or adults in places that offer them some protection from the elements – under tree bark and logs, in the upper parts of the soil, deep down in grassy tussocks, and even in caves. Water insulates aquatic insects against the cold. Cold water also carries more oxygen than warm water, so winter can be a period of growth for these insects.

Even so, shelter alone may not be enough to resist the coldest bite of the winter. Anti-freeze proteins prevent the formation of ice crystals, which would otherwise rupture cells. These only work up to a point and in really cold places some insects can control where the ice crystals form in their body without allowing damage to tissues and organs.

As the climate warms, insects in temperate places such as the

UK are facing new challenges. Our winters are getting warmer and wetter – regular snow cover is now rare in many places. Not only that, but spring is also arriving sooner. This is a double whammy of confusion for many insects. Indeed, climate change is an important factor in insect declines across Europe. On the downside, warmer, wetter

winters may allow insect pathogens to thrive, which might increase



Some species escape the cold by migrating – most famously the painted lady – but new research suggests that many other insects do this, too.

mortality in overwintering stages, especially pupae. Some species of solitary wasp are vulnerable to this.

Species that need colder conditions will be pushed north or to higher ground, until there's nowhere left to go.

On the upside, overwintering insects are extremely tough, able to take freezing temperatures and temporary submergence in flood waters. A warming climate is also bringing new insects to our shores. In the summer of 2020, myself and my colleagues found two bug species and a beetle – all new to the UK as they spread northward in response to climate change.



Dr Ross Piper is an entomologist, zoologist and explorer. His book *Animal Earth* is a cutting-edge introduction to animal diversity. Find out more at rosspiper.net