



Hidden worlds

When you're exploring RSPB nature reserves this summer, looking down (and under) can be as rewarding as looking up. Entomologist **Ross Piper** reveals the incredible diversity of tiny, often-overlooked, wildlife right under our noses.



Delve into the lives of tiny insects, such as this rove beetle (*Stenus cindeloides*), and you'll unearth some remarkable talents. This little character can even walk on water!



A graceful hobby snatching a dragonfly in mid-air. A kingfisher plunging into the water. A nightjar patrolling a forest edge. To many people, this is what RSPB reserves are about. But these reserves, all 214 of them, are about far more than just these large, conspicuous animals. Among every tangle of vegetation, under the bark of every dying tree and on the soft mud at the edge of every pond, a magnificent cast of “hidden” animals live out their remarkable lives.

These small animals might be lower down the food chain than the more visible animals we associate with these reserves, but they’re way more than just food for vertebrates. On the whole, the biology of this overlooked majority is poorly known,

but the few species we have a good understanding of reveal astounding lives that are much more varied and surprising than anything we see among the animals with fur, feathers or scales.

To see the hidden RSPB, what better place to start than RSPB The Lodge? The organisation’s headquarters nestles in a mosaic of heathland, woodland and grassland and its life has been well documented by RSPB staff over the years. So far, around 4,700 species have been recorded there, with more being added to the sightings list every year.

Mark Gurney, one of the RSPB’s ecologists, knows more about The Lodge than most – he and his colleagues maintain a database of all the species that have been found at The Lodge. Like me, Mark is a

huge fan of the under-appreciated life that surrounds us.

“There is so much to discover at the small scale,” he says. “So many ways of making a living. Many of these animals are bizarre, some of them are gory, and all of them are fascinating. It is easy to overlook the needs of animals that are so small, because they use the world in a way that is so different to us. We might not give a second thought to a little patch of bare ground or a clump of ivy, but that might be the whole universe to an insect. At The Lodge we keep things varied and patchy to provide as many of these resources as we can. To an oversized human it might look scruffy, but it is food, shelter, and socialising for a buzzing community of small animals, all with different needs.”

The formidable beewolf
hunts, embalms and
stockpiles bees for its young.



Most of these species are small and easily overlooked, but the best way to see them is simply to explore the network of trails. I love to do this, and probably miss loads of interesting birds because my eyes rarely venture skyward. I scan the ground around my feet and the nearby vegetation with a search image in my head for insects and spiders. Do this yourself in the summer and some of the first things you'll start to notice are an array of wasps – an extremely diverse group of animals that range a long way from the black-and-yellow animals that can ruin an afternoon in a sunny beer garden.

WEIRD WASPS

Perhaps the most dramatic of the wasp specialities of *The Lodge* is the beewolf, which also happens to be one of the

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best-understood wasp species. This industrious insect excavates a subterranean cluster of brood chambers to stock with prey; honeybees paralysed with venom. A single female may stock her nest with as many as 147 honeybees. Each bee has to be located, tackled and stung at the hunting-ground before being airlifted back to the nest, which might be more than 1km away.

Inside the nest, the female beewolf embalms her prey in special secretions that prevent the condensation of water, thus impeding the growth of fungi and bacteria. She also daubs white symbiotic bacteria from antennal glands onto the interior wall of the brood chamber before sealing it up. The mature beewolf larva incorporates some of these bacteria into its cocoon, ▶

Green dock beetles (*Gastrophysa viridula*) can be found across the UK in May.



► where they inhibit the growth of pathogenic bacteria and fungi during the long winter. The white daubing on the wall also serves as an exit marker, so the new adult knows the way out when it emerges.

More common than the beewolf are other solitary hunting wasps, such as *Cerceris rybyensis*, which has a similar lifestyle but targets solitary bees. This species has a cuckoo, a glorious jewel wasp (*Hedychrum niemelai*) with a cunning trick to deceive its host. The hosts are sharp eyed and alert for their enemies but, when they're away hunting, the cuckoo can duck inside the nest, gobble the egg of the host and lay its own egg in a brood chamber. In the pitch darkness of the nest, the host can no longer rely on vision and so must resort to scent, but the cuckoo mimics the odour of the

host almost perfectly. The cuckoo's odour cloak allows it to get on with its dirty work unmolested if the host returns.

The beautiful thing about watching these insects is that once they've got used to your presence they carry on as if you're not there, allowing you a ringside seat on their life, only snippets of which we know. A team of scientists in Germany have spent years studying the fascinating biology of the beewolf and their work is a constant reminder that we know next to nothing about most of the species we share the planet with. Behind every scientific name there is an incredible life waiting to be studied.

DOWN ON THE GROUND

To further immerse yourself in this world of miniature marvels, find a nice bit of sparse

vegetation at the side of the path, lie down on your belly and let your eyes adjust. You might see tiny beings darting around; the grasses and other plants a towering forest to what are our smallest insects. Fairy wasps and featherwing beetles are on the cusp of what we can see with the naked eye – their odd wings an adaptation to flight at this scale, which is more like swimming through water. Small they may be, but fairy wasps in particular are of considerable ecological importance, as they lay their eggs in the eggs of other insects and therefore regulate the populations of many other species. At this scale, finding a mate is a real challenge, so some species of fairy wasp do all their mating in the host egg; blind, wingless males mating with their winged sisters who will leave to find more host eggs. ►



7 STRANGEST SPECIES

Life at macro level can be weird, wonderful and well worth watching...

1. SNAIL-KILLING FLY

As larvae, these feed on hapless snails, consuming perhaps three or four to complete their larval development.

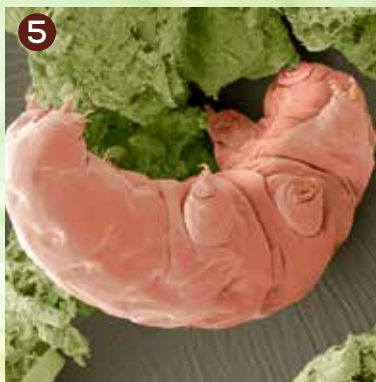


2. GALL WASPS

These hijack plants to make them produce galls (tough little capsules of food) where the larvae can develop.

3. PSEUDOSCORPIONS

Fierce predators, these abundant arachnids have a venom tooth on their pincers to inject neurotoxin into their prey. They spin silk from their jaws to build tiny igloos in which to shed their skin, lay their eggs or shelter from cold.



4. BUZZING SPIDER

The male of this common species vibrates his abdomen against a leaf; buzzing to attract a mate.

5. TARDIGRADES

These are too small to see with the naked eye, but extremely abundant. If their watery habitat dries out they enter a state of suspended animation (cryptobiosis) in which they can survive.



6. FAIRY WASP

As fairy wasps go, this one is quite large at 0.8mm long (seen here next to a pin). A fairy wasp from Costa Rica is the smallest known insect at 0.14mm. Flight at this scale is a bit like paddling through water, hence their strange wings.

7. HYDRA

Common in ponds, these belong to the same group as jellyfish, corals and anemones. They subdue even small animals with venom-loaded harpoons and they can bud off miniature clones.

Photo: Jennie Smith, Neil Phillips, Nick Upton, Richard Revels (all rspb-images.com); Ross Piper; Alamy

► In May and June take a close look at the yellow flowered St John's Wort along these same paths. This is the food plant of a handsome, albeit nervous little leaf beetle that will tumble to the ground if you disturb where it's sitting. *Cryptocephalus moraei* and its relatives are all commonly known as pot beetles because the female encases her eggs in little plates of faeces before flicking them away into the leaf litter.

When the larvae hatch they trundle around on their long legs with the egg case held aloft and most of their body tucked inside it. As they grow they enlarge the egg case with their own faeces to form a beautiful little pot that functions as a mobile bunker they can retreat into at the first sign of trouble. The tough, angular head of the larva plugs the pot perfectly. Some pot beetle larvae even live deep down in red wood ant nests where they feed on nest detritus and perhaps their host's brood.

MID-AIR SHOOTING MATCHES

Although The Lodge is mostly free-draining, sandy soil, there are some lower lying areas that are more boggy and here you have a good chance of seeing what I think is one of the most remarkable insects – a *Stenus* rove beetle (see first spread).

Even many beetle fanciers give rove beetles a wide berth because there are so many species (more than 1,100 in the UK alone) and some of them are very difficult to identify, but *Stenus* is one of the most distinctive genera. They're quick, graceful insects with huge eyes and some astounding adaptations. They stalk vegetation and the margins of pools and lakes on the lookout for their prey. Springtails are a favourite, but with a flick of their furcula these little beasts

propel themselves into the air and in a fraction of a second they'll give the predator the slip. *Stenus* has a secret weapon though; telescopic mouthparts that can be shot out faster than the springtails can jump away. The end of this structure snags the prey and tugs it back to the beetle's gnashing, sickle-shaped mandibles.

Not only does *Stenus* possess one of the most fabulous prey-capture devices of any animal, it also has a neat way of giving its own enemies the slip. They're so small and delicate that they can walk on water, their tiny mass easily supported by surface tension, but when they need to make a quick getaway they squirt a special compound from their anal glands that breaks the surface tension behind them and shoots them forward. Scaled up to our size they would be moving at 600–900kmh.

MUCH MORE TO DISCOVER

This is just a flavour of the awe-inspiring diversity of life that can be found at any RSPB reserve. The real beauty here though is that you don't need any special equipment to find this hidden world. All you need is a curious nature and a willingness to observe. Take a few hours to really see nature and you'll be rewarded with some moments that will stay with you forever and deepen your appreciation of our beautiful home.



Ross Piper is a zoologist, entomologist and explorer. His book, *Animal Earth*, is a cutting-edge introduction to animal diversity. His TV work includes the BBC series, *Wild Burma: Nature's Lost Kingdom*.

IN NUMBERS

- 16,000** species recorded from all UK RSPB sites
- 4,000** beetle species in the UK
- 23,000** insect species in the UK, at least
- 1.05 million** described insect species worldwide (millions more to be discovered, described and studied)
- 4%** proportion of described animal species that are vertebrates
- 0.14mm** size of world's smallest wasp
- 7–22 billion** individual nematodes in 1 hectare of farm soil
- 421** insect species associated with oak trees in the UK

EXPLORE HIDDEN DEPTHS

Discover the tiny, hidden wildlife near you! Visit rspb.org.uk/reserves to find your local reserve and see what's on.

The gorgeous jewel wasp *Hedychrum niemelai* is a ruthless opportunist, using an odour cloak to sneak its eggs into other wasps' nests.



Photo: Alamy