



Detritivores and Decomposers¹

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It's a commonplace observation that most of the vegetation in your garden survives until autumn. From which we can conclude that, however annoying slugs, caterpillars and aphids may be, they stop far short of eating everything there is to eat in the average garden. Yet, irrespective of whether you leave them where they fall or collect them all together in the compost heap, all those leaves eventually disappear, and their components are recycled.

Cycles of materials are a feature of all ecosystems. For some elements, like carbon and nitrogen, their brief sojourn in plants and animals is part of a much larger cycle that also includes the atmosphere. Others, like phosphorus, just go round and round in more or less the same place, with rather little lost or gained. Either way, the path they take is characteristic of different kinds of ecosystem and in this respect, gardens are a lot like woodland (and not at all, for example, like pasture). In gardens, most plant growth is eaten only after it's already dead, by specialised consumers known as decomposers or detritivores. Most of these decomposers reside in the soil.

Microscopic decomposers

Most decomposers are both very tiny and unimaginably numerous. A square metre of ordinary garden soil may contain 10 trillion bacteria and actinomycetes. Actinomycetes (which look like fungi but are actually bacteria) often secrete antibiotics and are also responsible for the 'earthy' smell of freshly-turned soil. These in turn are preyed upon by millions of single-celled protozoa. Fungi are equally abundant, but also effectively invisible most of the time, although some of those that form a symbiotic association with plant roots (mycorrhizas), essential for the healthy growth of many plants, regularly appear above ground as the familiar toadstools. Some fungi are actually predators, setting elaborate traps for passing nematodes.

Nematodes and springtails

The boundaries between herbivory, predation and parasitism are often blurred, and nowhere is this more true than in the soil. Eating soil fungi, protozoa, bacteria and dead organic matter, and parasitising all the larger animals and plants, are the nematodes or roundworms. There may be five million in a square metre of soil, but they average only one millimetre in length so they're more or less invisible. Among the most numerous large animals in the soil (and by 'large' I mean very small, but at least visible) are the springtails, animals that would be the star of any circus if only they were bigger. A springing organ, shaped like a tiny tuning fork, is clipped below the abdomen and released when needed, sending the animal spinning through the air. Eating dead plants and fungi, springtails are the garden equivalent of krill; a square metre of soil may contain 60,000. All springtails are vegetarians, but the equally abundant mites (related to spiders, and with the same eight legs) include both herbivores and predators.

Woodlice

If we move up to animals of a size range that might actually be noticed, by far the most numerous are woodlice, at least as numerous as all other larger ground-dwelling animals combined. Despite being extremely abundant, there are only about 30 different species in the UK. The Sheffield BUGS study of 61 gardens found only eight species² of which two (*Porcellio scaber* and *Oniscus asellus*) were ubiquitous and very abundant. They look very similar, but *Porcellio* is dull and rough, while *Oniscus* is more shiny. Woodlice are crustaceans, like crabs, and almost as poorly adapted to life on land. They breathe through gills and are in constant danger of drying out, which is why they spend the day in cool, damp refuges, emerging only at night. One or two garden woodlice will eat soft living plants, but the jaws of most (including the commonest) simply aren't tough enough, and they mainly eat dead plants, fungi, animal remains and dung. Unrelated to woodlice, but sometimes looking rather similar and sharing their habits and food preferences, are millipedes. Millipedes sometimes get the blame for holes in plants (for example in potatoes) but their jaws are weak and they probably only gain entry after previous damage by slugs or insects.

Beetles and flies

Many Coleoptera (beetles) eat dead material as larvae, and some as adults. The magnificent stag beetle that is now probably surviving better in gardens than in the countryside has a huge grub that feeds on damp dead wood. There are specialist groups of beetles like scarabs that consume dung, assisted by dung flies in the family Scathophagidae. Life would be pretty unpleasant without the help of these useful insects, and without the very specialist sexton or burying beetles that dig beneath small animal corpses and literally bury them as food for their larvae. Houseflies and blowflies lay their eggs on corpses and rotten material and their exquisitely revolting maggot larvae are hugely important in disposing of unpleasant waste.

Earthworms

Out of sight, out of mind below the surface, earthworms are perhaps the most important soil animals of all. Earthworms often burrow through the soil, pushing loose soil out of the way, but they can also literally eat their way through the soil, excreting the soil after digesting the organic matter. Not all species excrete soil at the surface, but those that do produce characteristic worm casts. Some owners of fine lawns are not fond of worm casts, but an abundance of worms is a sign of a healthy garden, and worms are extremely important improvers of soil structure, aeration and drainage. The largest species, the lob worm or *Lumbricus terrestris*, emerges at night and drags dead leaves into its burrows, which can be quite a startling sight if you're out in the garden after dark. *Lumbricus* is one of the deepest burrowing of all worms, capable of going down several metres, especially when surface soil is dry or frozen. There are several other common species in gardens; the green worm, *Allolobophora chlorotica*, a small to medium-sized worm, is one of the commonest. Despite its name, it's never more than a very muddy green colour.

Compost heaps

Not surprisingly, since life in the soil is fuelled largely by dead plants, most soil animals are extremely abundant in compost heaps, which serve as habitat and food all rolled into one. Compost heaps are particularly rich in earthworms, although the typical compost heap worm, the brandling, is an animal of rotting vegetation and is not found in soil. In fact compost heaps are excellent wildlife habitats, providing habitats for animals of decaying fungi, carrion, dung, dead wood and nests of birds and mammals, many of which wouldn't occur in gardens at all otherwise. To be colonised effectively by soil animals, a compost heap should always be sited on bare soil rather than on a hard surface such as concrete. Don't worry, by

the way, that compost animals will be harmed if the heap gets hot; the animals will just move to the cooler edges and move back to the centre when it cools down.

Remarkable diversity

The astonishing abundance of animals on, and just below, the surface of the soil in the average garden is witness to the importance of the food chain with dead, rather than living, plants as its base. Few gardeners are aware of this, because most of the animals near the bottom of this food chain are small, subterranean, nocturnal, or all three. Yet much of the larger and more obvious wildlife in your garden depends on the soil community for its survival. Good gardeners, who know that growing healthy plants depends on looking after their soil, and in particular on making compost, mulching and avoiding soil compaction, will be rewarded with more wildlife too.

¹ Reviewed by Steve Head

² Smith, R M., Warren, P H, Thompson, K and Gaston, K J. (2006) Urban domestic gardens VI: environmental correlates of invertebrate species richness. *Biodiversity and Conservation* **15**, 2415-2438.