The complexity of garden food webs

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The big question is, how do all the species in gardens fit together? The simple answer is that we don't know. Based on what she found in her Leicester garden, Jennifer Owen was able to deduce that some pathways of energy and materials must be important there[1]. For example, plant-moth-parasitoid wasp and plant-sawfly-parasitoid wasp. Adding another link, plant-aphid-hoverfly-parasitoid wasp looks like a good bet too. Predation by spiders must be important too, given their abundance, so many hoverflies (and other flying insects) must end up as food for spiders, and of course for birds. But, as Owen acknowledges, these are merely small parts of complex webs, and it's certainly impossible to recognise discrete trophic levels in the classical sense.

Ultimately, by one route or another, everything becomes food for the decomposer community, and we have even less idea what is going on below ground. For example, organic matter enters the soil both from above ground as litter such as fallen leaves and below ground through growth of plant roots. Fine roots of most plants have a short lifespan and turn over at a high rate. The roots themselves, their organic exudates and in most species mycorrhizal fungi are all food for bacteria and soil animals, and we are only just beginning to understand the important pathways for carbon through this complex web[2].

Complex food webs

One big problem is that few if any researchers are prepared to tackle gardens, with their extremely diverse plant communities. One can see why when you look at the complex communities revealed by focusing on a single plant species. In a classic study at Imperial College[3], broom (*Cytisus scoparius*) was found to support 19 herbivores (3 Lepidoptera, 4 Diptera, 7 Coleoptera and 5 Hemiptera), which in turn were food for 60 predators (insects, spiders, mites, harvestmen, birds) and 66 parasitoids (mostly wasps, but a few flies). In all, 370 trophic links were uncovered, and it's by no means certain the researchers found them all. One thing is certain: everything in your garden is connected to everything else, and if you think you can attempt to manipulate any part of the system without affecting anything else, you're mistaken.

Parasitoids rule!

A final point worth stressing is the number of times parasitoids feature in any discussion on garden diversity. Parasitism generally has a bad press, and most people regard it as somehow a less noble profession than predation. But parasitoids are the most diverse group of animals in your garden, and not only are they a major part of garden biodiversity in their own right, they do an important job. It's generally reckoned that around 99 % of potential pest outbreaks in farms and gardens are controlled by natural means before you even notice them[4]. Without parasitoids, that figure would be significantly smaller.

Reviewed by Steve Head

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[1] Owen, J. (2010) Wildlife of a Garden: A Thirty-Year Study. Royal Horticultural Society, London.

[2] Pollierer, M.M., et al. (2007) The underestimated importance of below ground carbon input for forest soil animal food webs. Ecology Letters, 10, 729-736.

[3] Memmott, J., N.D. Martinez, and J.E. Cohen (2000) Predators, parasitoids and pathogens: species richness, trophic generality and body sizes in a natural food web. Journal of Animal Ecology, 69, 1-15.

[4] Thacker, J. R. M. (2002) An Introduction to Arthropod Pest Control. Cambridge University Press, Cambridge