Pollinators and other beneficial insects in orchards – don't do away with dead wood.

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I started thinking about pollinators four years ago whilst photographing blossom. I had recently started working for Vale Landscape Heritage Trust, managing their land which includes several orchards, giving me a habitat to study which I had paid little attention to in the past. I had also given little thought to the pollinators themselves, as like many people I had taken it for granted that pollination was all down to the Honey Bee *Apis mellifera*. This understanding had come from the much-used quote from Maurice Maeterlinck's 1901 book *The Life of the Bee*, *"If the bee disappeared off the face of the earth, man would only have four years left to live"*.

However, I began to question this during my time photographing in a plum orchard where I only occasionally saw Honey Bees at work in the trees despite there being hives present. These bee-hives were removed as the local bee-keeper had retired and yet there was still a bumper crop of plums the year after, also watching the Honey Bees it was interesting to see how they work a flower thoroughly not dashing about from one to another. Being equipped with a sting and feeding in a group means they are less likely to be predated and so can spend time at one flower and in one tree. I would expect this to result in little cross-pollination, which I understand can be important in fruit production. The extent to which cross-pollination can occur was brought to my attention when Jane Scott gave me three apples, picked from three separate trees all of which were grown from pips taken from the same parent apple. These three fruits were completely different (01) and were presumably the result of cross-pollination of the original parent apple, so could this really have been the work of the conscientious Honey Bee?

01. Three apples from three separate trees all grown from pips from one apple.

When I looked more closely at blossom I soon found that there were many different insects feeding on the nectar and eating (and spreading) the pollen. There were also some insects such as dungflies which were feeding on the pollen-eaters (02), but all were carrying pollen on their bodies either deliberately or accidentally from one flower to the next, one tree to the next and so on.

02. Predatory dung fly on cherry.

I set myself a challenge: to combine the beauty of blossom with my lifetime's interest of insects and to capture as many species as possible in photographs. This soon led to further thinking about what else the pollinators required from our orchards, their life-cycles and need for places to nests or habitat for their larvae, one constituent kept reoccurring – deadwood.

This article is the result of my wanderings and wonderings and is not in anyway a scientific study or a deliberate attempt to find links between species and habitats. A much more detailed study of orchard biodiversity can be found in a report by Wyre Forest Study Group (Smart & Winnall 2006) and a study of saproxylic insects in a traditional Worcestershire orchard (Alexander, Bower & Green 2004). I merely wish to add to the conversation about the state of pollinators in general and what they need *from* us to be able to continue to do so much *for* us.

My approach has not been structured in any way and my observations have been *ad hoc*, made on any occasion that I happened to be in an orchard or remnants of such places during blossom time. It soon became clear to me that the Honey Bee, as important as it may be, is far from alone in its vital work as pollinator and a more appropriate quote might be that of Edward O. Wilson *"If insects were to vanish, the environment would collapse into chaos"*. He also said something which captures the essence of my personal approach to 'research' and discovery *"Adults forget the depths of languor into which the adolescent mind descends with ease. They are prone to undervalue the mental growth that occurs during daydreaming and aimless wandering"*. I may have left adolescence behind some time ago but I continue to wander aimlessly and daydream. This combined with a sprinkling of ignorance of the ecology of orchards allowed me to build up my own picture of the pollinators' world without preconceptions and present it with a small helping of supposition.

The main sites where my observations were made are Vale Landscape Heritage Trust's orchards:

Hipton Hill, a 70 acre old plum orchard with trees of approximately 70 years of age in various states of decline and decay. The trees stand in flower-rich grassland which is cut in late summer leaving a good sward height (generally over 5 cm), always leaving areas of grass uncut between the trees. There is some grazing by sheep in sections through the year.

Naunton Beauchamp, a beautiful old apple and pear orchard on ridge and furrow with trees all over-mature with abundant Mistletoe. There is a significant amount of deadwood in the trees and on the ground. The grassland has been over-fertilized and over-grazed in the recent past.

Stocken Orchard, a mature cider apple orchard adjacent to Tiddesley Wood near Pershore. The trees are being managed after a period of neglect and deadwood resource being increased but is limited so the location adjacent to Tiddesley Wood is probably of benefit to the pollinators. The grassland is managed by grazing and cutting in time with the apple harvest. This means grazing during the period when grassland plants are in flower so one quarter of the orchard is fenced each year and left to grow in rotation resulting in a flower-rich sward.

Observations were also made at other sites:
Evesham Country Park, an old mixed orchard including some cherry trees with little or no management at present. Bramble and tussock grasses are abundant in some areas creating ideal habitat for insects as well as nesting birds.

Worcestershire Wildlife Trust's Tiddesley Wood track has several pear trees of varying ages and the extensive Knapp and Papermill reserve near Alfrick has scattered old field-edge fruit trees and newly planted specimens in varied habitats.

The blossom in this study includes wild relatives of the plum as they start the flowering period and are an important food source for the pollinators before the fruit trees bloom.

The first to flower is Cherry-plum *Prunus cerasifera* which blooms from late February into March and is found in hedgerows as well as being present in old orchards, planted to aid pollination and as the result of its use as an unsuccessful root-stock variety. This is followed by Blackthorn *Prunus spinosa* which varies depending on the weather but is usually in flower from March into April. The cultivated Damsons *Prunus insititia* and Plums *Prunus domestica* are next, varying their flowering time depending on varieties, but starting in April. Then Cherry *Prunus avium* and Pear *Pyrus communis* followed by Apples *Malus domestica* which also has an extended flowering period depending on varieties.

The timing of the blossom will affect the insects available for pollination. The plums blossom early when it can still be cold and wet, a time when Honey Bees can retreat to their provisioned nests but when most other insects which have emerged from hibernation still need to feed.

The pollinators noted on the blossom during the study include some of our larger insects such as bumblebees and hoverflies but also include many small beetles and flies which are easily overlooked.

Insects observed on fruit blossom:
Honey Bee: One domesticated species. Seen on warm sunny days early in the year concentrated around Cherry-plum and on all fruit types. They nest in purpose-built hives and occasionally dead or decaying hollow trees.
Bumblebees: 25 species. I have noted just three species so far on several occasions in plum and pear blossom. These are *Bombus terrestris*, *Bombus lapidarius* (03) and an unidentified cuckoo bumblebee. The bumblebees are ideal pollinators of fruit being large and very hairy they readily catch pollen on their body hairs as well as deliberately collecting it. They also lack the routine of the Honey Bee and fly from one tree to another frequently and then away. Queen bumblebees are the only survivors of the previous year's colonies and it is these that are on the wing in time for the plums. They require nectar and pollen through the year from March and many of the plants they need are seen as troublesome invasives to be eradicated. These start with sallows *Salix spp.* which flower just in time for the emerging queens to feed on and followed by dandelions, thistles, hogweed, ragworts and Ivy; all important for bumblebee survival. Some species nest in areas of tussock grasses whilst others nest in holes in decaying trees or the ground. Some gather moss to line their nests and I have witnessed this on several occasions as they scrape it off dead tree stumps in woodlands.

03. *Bombus lapidarius* on plum.

Solitary Bees: About 250 species. Not so easy to identify as the bumblebees but I have noticed a few different mostly undetermined species in all fruit types (04). These vary from Honey Bee-sized to just a few millimetres long and nest in various situations including holes which they dig in areas of short turf or bare ground and holes in dead trees.

04. Solitary bee *Andrena fulva* on plum

The presence of solitary bees attracts another important pollinator, the Dark-bordered Beefly *Bombylius major* (05). This furry bee-mimic lays its eggs in the nest holes of the solitary bees and is very common around plum blossom. I have also seen it on apple, pear and cherry blossom.

05. Beefly *Bombylius major* on plum.

Social wasps: nine species. These insects are around the orchards during fruit-picking time when they are not particularly welcome, looking for a share of what they have helped to produce by pollinating blossom. The queens are around during blossom time and the workers spend the summer hunting for caterpillars, aphids and other orchard pests, benefitting the fruit. Several species nest in hollow trunks of dead and dying trees including the Tree Wasp *Dolichovespula sylvestris* (06) and its larger cousin the Hornet *Vespa crabro*, although that species is more likely to be catching the pollinators rather than contributing to fruit production.

06. Tree Wasp *Dolichovespula sylvestris* nest.

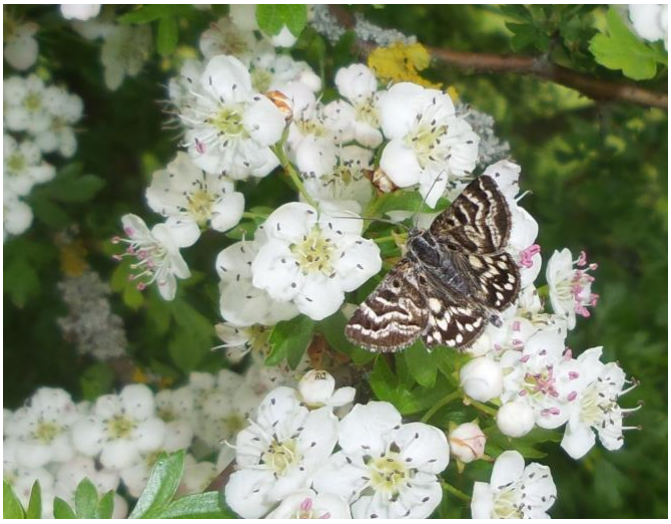
Ants: 50 species. I have found three species of ants living in orchard trees so far. *Lasius brunneus*, a small brown species which makes cells in the rotting timber of standing trees (07). The suitability of a tree (its state of decay) for nests is probably more important than the tree species (Green 1998). *Lasius flavus* a small yellow ant more often associated with the mounds it creates in old grasslands. I have found this species extending its earthy nest into open hollow plum tree trunks. *Lasius fuliginosus* which nests in the roots of old trees. The queen of this species is incapable of founding a colony on her own - she makes use of an existing *Lasius umbratus* nest, which in turn would have been founded in a *Lasius niger* nest (Partridge 2001). I have not yet seen ants within the blossom of any fruit trees but they are known to feed on nectar and so may well prove to contribute towards pollination.

07. *Lasius brunneus* nest in rotting plum wood.

Butterflies: About 60 species. So far I have only seen Orange-tip on apple (08) and cherry, and Brimstone on apple. Other species such as Red Admiral and Comma are present in the orchards during blossom time and may feed from the blossom. I have also seen Small Heath on Hawthorn flowers at the time that apple is in bloom but have not seen them visit apple. The larvae of the butterflies require various grasses and 'weeds' which are not found in tidy orchards.

08. Orange tip butterfly on apple.

Day-flying Macro-Moths and Nocturnal Moths: 875 species of macro-moths and over 1,500 species of micro-moths. The day-flying moths are generally on the wing too late in the year for most fruit blossom. I have seen Mother Shipton on Hawthorn blossom (09) in an orchard at a time when apple was still flowering but to date not on apple itself. Many of the nocturnal moths are on the wing at an appropriate time of year and I suspect this group may play part in fruit pollination. Unfortunately being out in the dark at a time of year that can be cold and wet has little appeal to me so I have no records of moths on fruit blossom (any volunteers?)!



09. Mother Shipton moth on hawthorn.

Beetles: I have noted many beetles, some small and others large and obvious on all fruit-types. Some appear to be doing only good for the fruit production; others are a little more suspect.

Malachites: The Common Malachite *Malachus bipustulatus* is abundant on apple blossom (10). Their larvae feed under bark of dead or dying trees and in the holes of wood-boring beetles, feeding on the beetle larvae and detritus.

Cardinals: I have seen Black-headed Cardinals *Pyrochroa coccinea* occasionally on apple (11). Their larvae feed on insects beneath the bark of dying or dead broad-leaf trees.

Longhorns: 68 species. I have seen several species on orchard trees from the tiny *Gracilia minuta* to the large *Stenocorous meridianus*. The common *Grammoptera ruficornis* (12) can be particularly abundant on apple blossom. Adults of all species require pollen and nectar from a variety of flowers including Hawthorn and Hogweed and their larvae develop in deadwood.


10. Common Malachite beetle *Malachus bipustulatus* on apple.


11. Black-headed Cardinals *Pyrochroa coccinea* on apple. Nicki Farmer.


12. Longhorn beetle *Grammoptera ruficornis* on apple.

Pollen Beetles etc: Over 100 species. Adults of various species are extremely common in all fruit blossom and are probably important pollinators. Their larvae are not always welcome as some feed in fruit, others feed in fungi and some live in the tunnels of wood-boring beetles.

Wood-boring beetles: around 60 species of *Ptinidae* plus other families. I have only identfied *Ptilinus pectinicornis* on apple but the presence of this group would appear to be important for many other insects which predate their larvae or live and breed in their tunnels in dead and decaying timber.

Tumbling Flower-beetles (*Mordellidae*): 17 species (difficult to identify). Two or three undetermined species feed in fruit blossom. Their larvae develop in dead wood.

False Flower-beetles (*Scraptiidae*): 14 species. I have identified two species so far in the hedges and orchard trees. Their larvae develop in decaying wood.

Earwigs: four species (three known from Worcestershire). I have found Common Earwig *Forficula auricularia* and Lesne's Earwig *Forficula lesnei* regularly in orchards throughout the year. Common Earwig has been found on pear (13) and apple blossom and both species will feed on aphids and other orchard pests. Adults of Common Earwig lay eggs and care for their young under deadwood and beneath the bark of dead trees. Lesne's Earwig has been found beneath bark in late winter.


13. Common earwig *Forficula auricularia* on pear

Bush-crickets: 13 species (seven species recorded in Worcestershire). I have found only Oak Bush-cricket to be associated with orchard trees. They are omnivores and the early instars have been found on plum trees and in apple blossom feeding on pollen. Adults feed on aphids and other small invertebrates and I have observed them laying their eggs in the cracked bark of mature trees.

Dung Flies: 54 species. I have noticed these flies (undetermined species) on all fruit blossom and their hairy bodies are ideal for transporting pollen. I think they are more likely to be eating pollinators rather than the pollen but they will surely be spreading pollen during their activities.

Black Fungus Gnats (*Sciaridae*): Around 150 species but currently no useable key (Mick Blythe pers. comm.). These tiny flies are ubiquitous and have been seen in abundance on apple, plum and pear blossom. What they lack in size they make up for in numbers. Their larvae require composting vegetation, rotting wood and associated fungi.

Hoverflies: About 280 species. *Platycheirus albimanus* is common on plum blossom and its larvae feed on aphids. The larger *Eristalis spp.* have been seen on plum, apple and pear. These flies are constantly on the move potentially spreading pollen far and wide. Wet muddy ground at pond edges and in ditches as well as well

rotted manure heaps provide habitat for the larvae of many species. Also wet ground under log piles and rot holes in trees are perfect for the rat-tailed maggot larvae of the *Eristalids* and *Myathropa florea* (14) amongst others.

14. Hoverfly *Myathropa florea* pupa and adult.

Soldierflies: 48 species. I have not yet recorded any soldierflies at blossom but I have found larvae and seen adults emerging from dead plum trees and rot holes in apple trees.

Dagger Flies (Empididae) and Dance Flies (*Hybotidae*): These two groups have nearly 400 species in Britain. I have found unidentified species of dagger flies to be abundant in blossom, especially plum. They are predatory but bury themselves deep in the flowers feeding on the nectar and pollen. The larvae of this group are also predatory and feed on invertebrates in the soil, rotting wood and some are aquatic. To mate the male dagger flies catch another flying insect and present it to a female who will allow copulation if she accepts the dead fly (not something to try at home!). However, size appears to matter with these predatory flies and so in spring they regularly catch large craneflies as a nuptial gift (15). Some of these craneflies have larvae which live in rotting vegetation and deadwood.

15. Dagger flies with large cranefly as a nuptial gift.

Conclusion:
The presence of untidy areas around orchard crops with tussock grasses and scrub containing deadwood is needed to ensure healthy insect communities. So many of the insects mentioned above require deadwood at some stage in their development, whether directly as food or as places to hunt and breed and some species feed on fungus which grows on decaying wood. We need to view dead and decaying wood as a valuable resource for so many reasons and not just something to burn on sight. With continuing problems in Honey Bee populations, we are likely to become ever more dependent on these alternative pollinators and we need to learn to love the tiny, the weird and the ugly!

There is a real need for a good deadwood resource in the shape of both standing dead trees with its associated rot holes (16) and fallen timber, essential for the survival of many pollinators and other beneficial insects and ultimately ourselves – 'Discuss ...'.

16. Rot hole in tree stump.

References

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Images
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15. Dagger flies with large cranefly as a nuptial gift.
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