SPIDERS AS POTENTIAL BIO-PREDATORS FOR CONTROLLING WOODWORM INFESTATION

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Most professionals working with the built environment are now committed to using fewer potentially dangerous chemicals whenever possible. A recent trial has shown that there may be scope for using spiders rather than sprays to control woodworm populations. The introduction of a few spiders can break the woodworm cycle by catching the beetles prior to laying the eggs of the next generation.

Background

The five-year trial followed the informal observations of *Pholcus Phalangioides* devouring a variety of prey during repairs to a property in Northern France where it is a legal requirement for buildings to be chemically treated as part of the formal property transaction process. The property had been comprehensively treated in 2005 with permethrin in a standard commercial water-based product applied as a spray.

All signs of life were eradicated, or so it seemed at the start of the project, but the following year it was clear that the woodworm (*Anobium punctatum*) had survived with plenty of fresh dust from beetles emerging in large numbers during the spring. After spraying there was also a conspicuous absence of any spiders with the exception of one or two ghostly Pholcus apparently missed by the killer-spray.

Pholcus phalangioides

This species of spider misleadingly shares the common name 'Daddy Long Legs' with the crane fly and the harvestman, neither of which are actually true spiders. There is a slightly better vernacular name: Cellar Spider, but Pholcus is by no means restricted to cellar-living, being happy to live under furniture, in cupboards or most conspicuously in top corners of living spaces where they like to hang in a characteristic upside-down position.

It is believed that these spiders are not native to Northern Europe where they are generally restricted to living indoors. They dislike cold draughts and rapid temperature fluctuations preferring average temperatures to be in the region of 8-10 degrees centigrade. In the UK they are more common in southern counties but are happy to prosper further north wherever conditions are suitable, sometimes enjoying the ride to new homes amongst the personal effects of people moving house.

Their webs are untidy and lack the regular geometry or 'funnels' associated with other species and the webs do not normally act as effective traps, with Pholcus preferring to actively seek out their prey. Their webs are essentially a base from which to hunt and a place for the eggs to hatch into juveniles. The silk also comes in useful when they encounter a potential victim by flicking it from their spinnerets before closing in and injecting venom. Fresh catches are bundled up and dropped after being sucked dry.

Despite their tantalisingly slow and graceful movements, these spiders are actually very efficient venomous carnivores but fortunately harmless to humans as their fangs are much too small to penetrate our skin. They have relatively small bodies with a female body length of about 9mm and males slightly smaller. However, the legs are about five or six times the length of the body (reaching up to 7cm of leg span in mature females). Their effective hunting method can even be used against other species of spiders including the large house spiders (Tenegaria) which can be up to ten times their weight. Another popular name for *Pholcus* is the 'vibrating' spider as they seem to oscillate when startled. The vibrating also forms part of their mating rituals after which the males usually die. Males rarely live for more than a year, but females can live for three years and usually have a considerable number of suitors.

How populations become established

A population of these spiders can grow very rapidly depending on the abundance of potential prey. The availability of a good food supply stimulates egg production and mating which can take place at any time of year. The female initially holds as many as 30 eggs in a silk net between her *chelicerae* (jaws) and when hatched the young transparent spiderlings share her web. Their growth depends on the availability of food and, if it is in short supply, the mother will re-ingest the young. Sometimes spiderlings eat each other, with the slightly smaller males being particularly vulnerable. The young will start making foraging trips and will eventually establish new territory away from the mother. The spider population is, therefore, self-regulating and will decline when food becomes scarce.

The study

At the property in France four unoccupied rooms were monitored over a five year period. In 2006 the main prey of the small population of Pholcus was the large number of emerging woodworm beetles that had been untouched by the chemical treatment of 2005. In response to this abundant food source, the few spiders generated huge numbers of spiderlings that survived into adulthood with an estimated 75 adults in the spring of 2007.

The life cycle of the *Anobium punctatum* can involve a long spell in the wood as the larvae derive energy for pupation before emerging

as adult beetles. A healthy population of hungry spiders at the time of beetles leaving the timber is crucial to form a significant break in the *Anobium punctatum* life-cycle; ideally before the mature beetles mate and lay eggs.

The estimated 75 adults in the spring of 2007 completely decimated the woodworm population with approximately 400 examples of beetles caught and wrapped in silk bundles. The subsequent decline in woodworm during 2008 and 2009 confirmed that they were being eaten, if not before mating, certainly before they were laying their eggs.

Once the rich food supply of beetles started to wane, the Pholcus population began to decline despite the reappearance of house spiders as an alternative prey. By 2011 the population had declined to approximately ten adults across the four rooms and most spiderlings were being ingested by their mothers.

Conclusion and suggestions for further research

A further research project could establish methods of producing spider colonies and how they could be supplied on a commercial basis to home-owners wishing to explore an alternative strategy to spraying. More formal studies would be able to confirm the effectiveness of introducing small numbers of juvenile spiders into buildings with woodworm infestation. There may also be scope for designing 'nesting places' to protect spiders from day-to-day cleaning. These 'nests' could be provided by the pest control companies as a 'green' alternative to the chemical methods.

There may be some perception-related obstacles that would need to be overcome as spiders are often wrongly associated with untidy or even unclean domestic environments. It is a myth that they like dirty or dusty places and *Pholcus phalangioides* will create a new web if the old one gets too dusty! Arachnophobia is another potential disadvantage for spiders as bio-predators, but their slow, graceful movements are actually not as threatening as the rapid movements of the 'big hairy ones' ... and they may even help remove the latter. On a globally significant note, there may be potential for *Pholcus Phalangioides* to tackle malaria especially if a nest can be designed to accommodate both spiders and resting mosquitoes.

About the author

Charles Hippisley-Cox studied Geology before working as an Historic Building Surveyor. He undertook architectural training as a mature student before working with the late John Ashurst at Bournemouth University. He is currently Senior Lecturer in Building Conservation in the Department of Architecture & 3D Design at Huddersfield University where he is also course director for Architectural Technology.

Further Reading

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