SHORT NOTE

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# Coccinellidae (Coleoptera) as vectors of mites

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**Coccinellidae, Acari, Astigmata, Mesostigmata, Prostigmata, phoresy**

**Abstract.** Mites carried by coccinellid beetles have been found to be important predators of scale insects. To investigate the possible wider importance of coccinellids as vectors of mites, we undertook a survey of the range of mites carried by coccinellids in one location in the United Kingdom. Deutonymphs of six species of mite were found phoretic upon coccinellids, and one species was observed that was parasitic. The importance of these observations awaits further study on the biology and ecology of the mite concerned. It is clear, however, that introduction of coccinellids to an environment will be accompanied by the introduction of mites.

## *Introduction*

The role of coccinellids (ladybirds) in biological control of aphid and coccid prey has been the subject of much study. A less appreciated and researched role of coccinellids in biological control is their importance as vectors of mites. One well studied system exists, the association between mites of the genus *Hemisarcoptes* and coccinellids of the genus *Chilocorus*. *Hemisarcoptes* spp. are important predators of diaspidid scale insects (Gerson et al., 1990; Izraylevich & Gerson, 1993a, b; Ji et al., 1994). As in many mites, it has one life stage, the hypopus, in which the mite does not feed. Instead, it attaches itself to the under-surface of the elytra of *Chilocorus* adults, and disperses with them to new host plants. Dispersal in this phoretic manner is an important feature of the biology of many astigmatid mites (Houck & O'Connor, 1991), and is also observed in mites from other groups. Hypopi of two new species of mite in the family Hemisarcoptidae, *Congovidia coccinellidarum* and *Divilia occidentalis*, were recently described from British coccinellids (Fain et al., 1995). In order to widen our understanding of the interactions between coccinellids and the plants which are their habitat (henceforth, host plants), a survey was undertaken to investigate the range of mites carried by these beetles.

## *Methods*

A wide range of species of coccinellid beetles was beaten from a variety of host trees, or collected by eye from herbaceous vegetation, from near Juniper Hall, Surrey, UK (Map ref. TQ 174 524). Live specimens were taken into the laboratory, anaesthetized using a flow of carbon dioxide, placed under a binocular microscope, and both the ventral surface and the underside of the elytra examined for the presence of mites. Ladybirds found to bear mites were preserved in 70% EtOH, and the mites subsequently cleared, mounted, and identified using morphological characteristics.

## *Results*

Seven different species of mites were found associated with ladybirds in our survey, all of which were situated on the ventral surface of the ladybird. No specimens of *Hemisarcoptes* were found. Most commonly found were deutonymphs of the hemisarcoptid mite *Congovidia coccinellidarum* (Fain)

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(Astigmata: Hemisarcoptidae), as reported previously (Fain et al., 1995). In addition to *C. coccinellidarum*, three other hypopi of mites of the sub-order Astigmata were found. *Calvolia hagensis* (Oudemans) (Astigmata: Winterschmidtiidae) was found on *Adalia decempunctata* beaten from *Tilia* x *europaea*, *Halyzia sedecimguttata* beaten from *Acer pseudoplatanus*, and *Adalia bipunctata* beaten from maple, *Acer campestre*. No previous host has been recorded for this species, it being previously collected from litter (Fain, 1972). *Michaelopus leclercqi* (Fain) (Astigmata: Acaridae), was found on *Myrrha octodecimguttata* and *Exochomus quadripustulatus* beaten from pine. This species has in the past been observed as a phoretic associate of the ichneumonid wasp *Cremastus interruptor* (Fain, 1982). Further to this, we observed hypopi of *Troupeauia nova* (Oudemans) (Astigmata: Acaridae) phoretic upon *Adalia decempunctata* and *Exochomus quadripustulatus*. This species has in the past been recorded as being phoretic upon the pine weevil, *Hylobius abietis* (Oudemans, 1906) and the sphecid wasp *Crabro spinicollis* (Zachvatkin, 1941).

In addition to these phoretic Astigmata, a uropodid mite (as yet unidentified) was observed attached by anal sucker to the leg of *Adalia bipunctata* collected from *Urtica dioica*. Further to this, *Parasitellus fucorum* (De Geer) (Mesostigmata: Parasitidae) was observed on *Adalia bipunctata* collected from *Acer pseudoplatanus* and *Tilia* × *europaea*. This species is most commonly associated with bees of the genus *Bombus* (Hyatt, 1980).

One species of mite was observed that was not strictly phoretic on ladybirds, but rather was parasitic upon them. A larva of *Leptus ignotus* (Oudemans) (Prostigmata: Erythraeidae) was observed feeding upon *Propylea quatuordecimpunctata*. This genus of mites is associated with a wide range of arthropods (including both spiders and other mites), and this species has in the past been recorded from noctuid and geometrid moths in Western Europe (Southcott, 1992).

## *Discussion*

This survey, conducted in one locality over one week in two summers, has revealed a plethora of associations between coccinellids and mites. This leads us to the conclusion that the associations between mites and coccinellids are likely to be far more diverse than previously realised.

The importance of these mites is at the moment a matter of conjecture. In the main the mites found were hypopi, phoretic upon their host. The ecology of most of these species is unknown, and in most cases, the species are only known from the hypopal stage. The biology and ecology of the adult mites are unknown. Thus, the significance of the association of ladybirds with mites to the ecology of the host plant cannot yet be assessed. It is not clear whether the adult mites are entomophagous like *Hemisarcoptes cooremani*, phytophagous, or scavengers. Only in the case of *Parasitellus fucorum* can we make any comment. The adult stage of this mite is known, and is associated with leaf litter and bee nests. More research is clearly needed to elucidate the life-style of the other mites. The host-plants from which the beetles bearing mites were collected would be a good point from which to start. The finding of *Troupeauia nova* on the pine ladybird, for instance, augments its previous sighting on the pine weevil and *Crabro spinnicollis*, a sphecid which nests in wood, and strongly suggests that the adult stage of this mite is associated with coniferous trees.

In addition to the hypopi which are phoretic on coccinellids, one parasitic mite was found. This observation is of interest to studies of parasitism of coccinellids. The interest does not derive from the damage the mite itself causes their host. The parasitization rates observed are too low for this. Rather, the interest derives from the possibility that these mites could transmit inherited parasites (bacteria) to their hosts. Coccinellid beetles are host to a wide range of inherited bacterial symbionts (see Hurst et al., in press). In general, inherited symbionts do not survive outside their host. They are thought to be transmitted following parasitic events, from parasite to host and vice-versa (Werren et al., 1995). The parasitic mite of coccinellids, *Coccipolipus hippodamiae*, has already been suggested as one possible initial source of infection of ladybirds (Hurst et al., 1995). The observation of *Leptus ignotus* suggests another potential source.

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