Intra-guild predation of hoverfly larvae by harlequin ladybirds

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It has taken me too long to understand why we have had so many harlequin ladybirds (*Harmonia axyridis* Pallas, Coleoptera: Coccinellidae) in our front garden, TL986244. We found them there for the first time in 2005. We had been away for a while, and when we came back in November we found the place teeming with them, at all stages of development – except the eggs. It was a real hotspot. Curiously then they seemed to thin out along the street; as we are on the crossbar of a T-junction, it looked to me as if they had hit us during their migration path from the main road. I was wrong. The real focus of attraction was our sycamore (*Acer pseudoplatanus* L.). Two years later I finally put two and two together after reading that the first records of harlequin ladybirds shortly after their arrival from the continent in 2004 were associated with sycamores (Bowdrey & Mabbott, 2005). Indeed sycamore trees do have a lot of aphids and, in terms of biomass of foliage invertebrates, score as high as our native oaks (Alexander *et al*., 2006).

So, after the penny dropped, I quickly went to check the trees overhanging some railings in Colchester Castle Park, TL999254, another harlequin hotspot (see Theo Tamblyn's article in this issue). Sycamores again, plenty of harlequins (Plate 4), and predacious hoverfly larvae (Plate 7). To my surprise, when I saw the pictures in my monitor, I realised that a couple of harlequin adults were feasting on one of these hoverfly larvae (Plate 5). They are an easy prey to attack. Hoverfly larvae with their tiny heads are no match for the harlequin ladybirds, unfortunately; they lack the long pincers and swift legs of lacewing larvae (Fremlin, 2007a). Instead they move in the most fetching way, waving around their rather pointed head end before deciding where to go next, probably looking for aphids, their basic diet too.

When I found parasitised harlequin larvae previously (Fremlin, 2007b), I did not bring them home. I have now learned my lesson. I went back and collected some hoverfly larvae to identify them. There were quite a few there and in our front garden too. I managed to rear a couple of imagos on aphids and whiteflies from my allotment cabbages. Two adults emerged and were subsequently determined at the

Colchester Natural History Museum. Both were males, a *Syrphus ribesii* (Plate 8) and a *Platycheirus scutatus*, (Diptera: Syrphidae). These two species feed on aphids as larvae.

I have now learned that there are over 250 different species of hoverflies in the UK, and that they are remarkably diverse. The adults feed mainly on nectar but their larvae have a wide range of feeding habits, with over one third preying on aphids (Duke, 2006).

It was interesting finding underneath sycamores, as late as November 2007, hoverflies and harlequin ladybirds in the larval stage. Indeed one month later they were both still around. I spotted my last hoverfly larva on 1st December, but the last instar harlequin larvae carried on a bit longer.

What are the chances of these larvae surviving a cold snap? Well, *S. ribesii* larvae did not have far to go; third instar larvae overwinter successfully in moist sycamore leaf litter (Hart & Bale, 1997). Not sure about the other hoverfly species though, but generally hoverflies overwinter in the pupal stage, safely inside their puparia (Mahr, 1995).

On the other hand I have observed that last instar harlequin ladybird larvae do not seem to survive the winter very well in our front garden; there isn't much for them to eat any more and they do not seem to have enough energy to spare for pupation. However the adults have no problem in finding shelter; they started appearing indoors on 21st November. Overwintering in people's homes is a well known habit of harlequin ladybirds. It is unpopular as the ladybirds leave unsightly stains.

I wondered about the harlequin ladybirds that were still in their pupal skins in late November. When ladybird larvae prepare to pupate, they shed their spiny larval skins. This contrasts with hoverflies which pupate inside their skins. The ladybird pupa anchors itself at the base of its skin. This is one of their defences against predators. This is performed in the open.

So I decided to monitor the harlequin pupae under a couple of sycamores. By March they had either disappeared, probably knocked out, or were dead; I found no exuviae (empty pupal skins). So their survival rate is probably very low. However the ones in the Castle Park seemed to have fared better; on January 20 quite a few, possibly teneral (freshly emerged) adults were seen by Theo Tamblym (*pers. comm.).* These pupae were in a much sunnier and more sheltered spot than mine, and January 2008 was unusually mild.

Even though monitoring overwintering pupae proved rather difficult, it would be worth repeating it in as many places as possible, in particular if our winters get milder.

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I have in the past thanked an oak tree for being such a magnanimous host, and I suppose that, to be fair, I must now do the same to our sycamore; not so popular though. Both trees have been an incredible source of stimulating observations ever since the harlequin ladybirds turned up on the scene.

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Plate 4. Harlequin and two-spot ladybirds overwintering together.

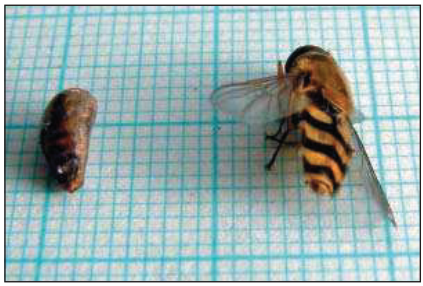

Plate 5. Harlequin ladybirds (*H. axyridis* f. *succinea*, left, and a melanic form, right) preying on a hoverfly larva. Photo taken on 01/11/07. **Plate 6.** Harlequin ladybirds *H. axyridis* on a railing. Note the different development stages present: larvae, pupae and adults; some of the adults are misshapen. Photo taken on 01/11/07. **Plate 7.** Hoverfly *S. ribesii* larva on a railing, the head is the tapered end pointing down. Note the two tiny bumps at the blunt end; they are the external portion of the larva's respiratory system, the spiracular plates. Photo taken on 01/11/07. **Plate 8.** Hoverfly *S. ribesii* puparium and adult on millimetric paper, div. 1mm. The puparium is the hardened skin of the last larval instar; note inside it the yellow stripes of the adult's abdomen. Photo taken on 29/11/07.