

**Exceptionally large swarms of *Hilara* spp. (Diptera, Empididae) over a fish-free partly shaded pond.**

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Over the past few years regular swarming of flies on warm sunny days was observed over a pond (roughly 40 x 15 metres) at Carpenter's Farm, Berrow, (SO775339), but these occurrences were not investigated until May 2016 when strikingly large swarms were seen. The swarms consisted of thousands of flies flying fast and level in an oval circuit of about 5 x 2 metres, always anticlockwise and between one and two metres above the water (01, 02, 03). The swarms were in the middle of the pond, with the circuit more or less

parallel with the shore. This made sampling difficult, as access to deeper water was precluded owing to the bed of the pond being treacherously soft. In the end a lightweight net was fixed on a 5-metre handle which enabled samples to be taken more or less from the line of flight. The following flies were identified in samples taken in this way.

*Hilara maura* (Fabricius 1776) (Empididae): 7 (5 males; 2 females).

*Hilara quadrifasciata* (Chvála 2002) (formerly *quadrivittata*): 7 (all females).

*Hilara cornicula* (Loew 1873): 2 males.

*Rhamphomyia crassirostris* (Fallén 1816) (Empididae): 3 males.

*Hydrellia* sp. (Ephydriidae): 1.



01. *Hilara* fly swarm over pond. Martin Skirrow



02. Centre of *Hilara* swarm. Martin Skirrow



03. Two individuals in the fly swarm. Martin Skirrow.

The *Hilara* species are small dark flies with a wing length of 4 to 5 mm. Examples of males of *H. maura* and *H. cornicula* from the swarm are shown in 04; note the enlargement of the basal tarsi of the front legs characteristic of many empid males. Females of *H. maura* and *H. quadrifasciata* are shown in 05. This mix of species confuses the analysis of how the swarm was made up. It is unclear whether *H. maura* (mostly males) or *H. quadrifasciata* (all females) was the predominant species. During swarming the males of both these species pick up 'wedding presents' during surface skimming and wrap them up in silk for presentation to the female during mating. In our case, surface skimming was observed but not in sufficient detail to confirm the capture of prey (06). However, presumed male and female pairs joined by a bar of material can be seen in the photographs (07). According to Chvála (2005) there is a trend

towards picking up floating rubbish instead of prey and these may be favoured by the females because they can be larger and so more impressive (Adrian Plant, personal communication).



04. Males of *Hilara maura* (left) and *H. cornicula* (right). Martin Skirrow



05. Females of *Hilara maura* (left) and *H. quadrifasciata* (right). Martin Skirrow



06. Surface skimming by *Hilara*. Martin Skirrow



07. Presumptive male and female joined by a thread during gift-giving. Martin Skirrow

#### Swarming patterns

Chvála made observations on the swarming of several *Hilara* species. In the case of *H. maura* he states: “The adults fly in wild, very rapid, horizontal flight in swarms 1-3 m long, 20-30 cm above the water surface, rarely up to 50 cm ..... The swarms are formed by

very rapidly flying females. Below the swarm or even above it there are slow-flying copulating pairs or single males ready for mating. The prey is wrapped in a silken web, bound with a few strands of silk or almost completely hidden in a tight ball of silk. Most often the prey consists of chironomids or other Diptera, but even cicadellids, psyllids and other available insects may be taken as prey...” (Chvála 1996).

In the case of *H. quadrifasciata* Chvála describes how hundreds of females were observed in swarms 5-15 m long and 2-3 m high over an alpine lake in Austria (Chvála 2005). This pattern fits well the swarms we now describe, except that thousands rather than hundreds of flies were present in our swarms. By counting flies in representative squares on photographs and multiplying by a proportional factor, we estimate that there were at least 7000 flies in the swarm that was photographed (01, 02). Nowhere can we find descriptions of *Hilara* swarms of this size. So what factors could give rise to this profusion?

#### The pond

The pond in question was excavated in the remote past, possibly as a claypit, but more likely as a source of water for livestock. It is on pastoral farmland grazed by sheep and cattle. It is surrounded by mature trees: oak *Quercus*, maple *Acer*, sallow *Salix cinerea*, and hawthorn *Crataegus*, so it is partly shaded when the trees are in leaf. The soil is heavy clay and there is little percolation of water from the surrounding land. Rain is the only source of water. The banks are steep and well vegetated, though the water’s edge often evaporates back on a gently sloping shore of rotting leaves and wood litter that form the base of the pond. This litter has accumulated over many years and is deep. The pond is much reduced in late summer (08) but it has never been known to dry up completely. Until 2002 it was accessible to livestock, and the remains of several sheep that had been trapped in the mire were found at that time. In 2002, when the present owners acquired the farm, it was fenced off and has since remained so.



08. The pond in a much contracted state in September 2016. Martin Skirrow

Occasional blooms of Duckweed *Lemna minor* appear, but there are no other plants growing in the water. There are no fish but abundant invertebrates. Among them are crustaceans such as water louse *Proasellus meridianus*, freshwater shrimp *Grammarus*, and seed shrimp (Ostracoda). Insects found are: *Podura aquatica* (Collembola); the mayfly *Cloeon dipterum*; water beetles *Acilius sulcatus* and *Hydroporus palustris*; whirligig beetle *Gyrinus substriatus*; backswimmers *Notonecta glauca* and *N. maculata*; waterboatmen *Corixa punctata* and *Heterocorixa sahlbergi*. The backswimmers and waterboatmen are at times sufficiently numerous to give the impression of light rain as they break the surface of the water. Insect larvae such as blood worms (chironomid larvae) are also plentiful. Invertebrate profusion was certainly an attraction for

a pair of Grey Wagtails *Motacilla cinerea* passing by in September 2016 (09).



09. One of a pair of Grey Wagtails *Motacilla cinerea* feeding around the pond in September 2016. Martin Skirrow

### Conclusions

It seems that an ecosystem based on the deep litter of rotting vegetable matter accumulated over many years is what allowed the build up of so many *Hilara*. Invertebrates feed on the litter and they in turn are eaten by *Hilara* and other predators, both as larvae and adults. The absence of fish must be a major factor in allowing the build up of invertebrates in this way. It is not possible to be specific about whether *H. maura* or *H. quadrifasciata* were the principal swarmers, but judging from Chvála's description (see above) the latter is the more likely, as all our specimens were females and the size and height of the swarms are similar. In our case the accuracy of sampling left much to be desired and it was inevitable that flies flying around the periphery of the swarm were also included. More precise sampling is planned for next year, assuming similar swarming takes place.

### References

- Chvála, M. 1996. A phylogenetic interpretation of Palearctic species of *Hilara* and the tribe Hilarini (Diptera: Empididae). *Proc XXth Int Congr Entomol, Firenze*, p.24.
- Chvála, M. 2005. The Empidoidea (Diptera) of Fennoscandia and Denmark IV: Genus *Hilara*. *Fauna Entomologica Scandinavica* 40.

### Images

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