

# First record of the scuttle fly *Megaselia rufipes* (Meigen) in a Rose Chafer *Cetonia aurata* (L.) larva

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## Introduction

The scuttle fly *Megaselia rufipes* (Meigen) (Diptera: Phoridae) is a tiny fly which can easily be overlooked. It resembles a fruit fly but has a habit of running rapidly across a surface instead of taking to the wing. This species is native to the Palearctic Region, but has been carried around the world by humankind, except to the Oriental and Antarctic Regions. The larvae develop on a very wide range of hosting materials, mostly carrion, including human corpses, rotting organic matter and even in the nests of honeybees: either on detritus (see citations in Disney 1994) or as facultative parasitoids (Dutto & Ferrazzi 2014). Cases of facultative parasitism of beetles and of myiasis in people are also recorded.

Below we report how puparia of this scuttle fly were unexpectedly found together with a dead Rose Chafer larva *Cetonia aurata* (L.) (Coleoptera: Scarabaeidae: Cetoniinae) in captivity.

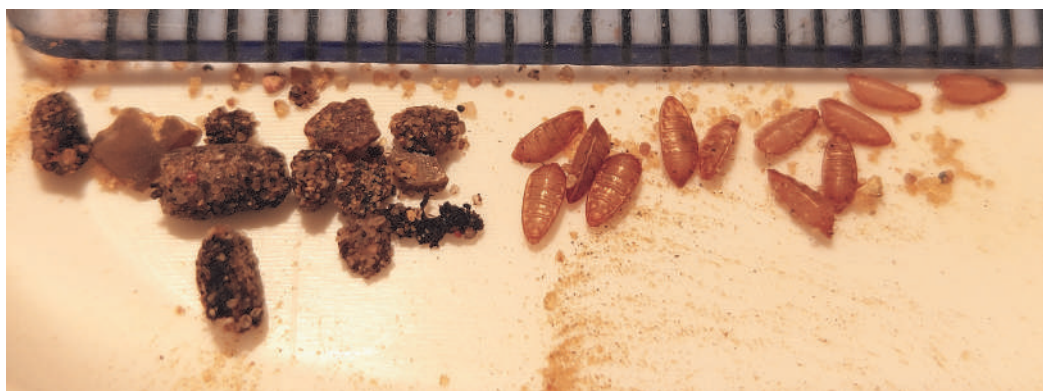


Figure 1. Faecal pellets (left) and puparia (right) found inside the cassette with the dead *Cetonia aurata* pre-pupa, 26 July 2023. Photograph © Maria Fremlin

## Experimental set-up

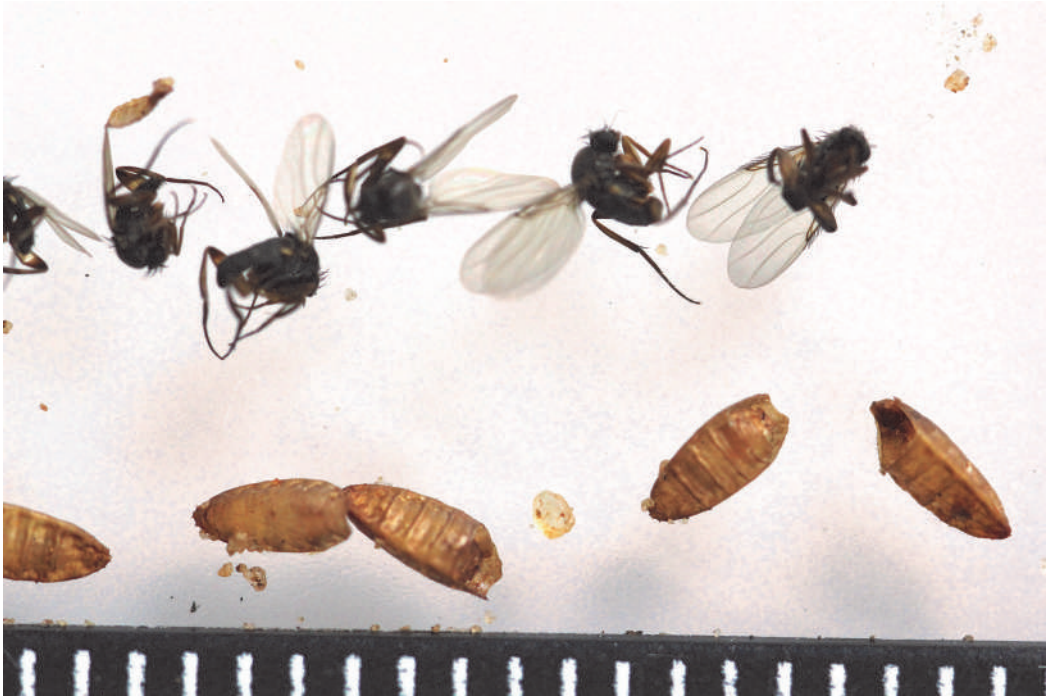
To confirm the findings reported in Vendl *et al.* (2016) of the behaviour of the flower chafer *Pachnoda marginata* (Drury) pre-pupa before their third and last moult inside a cocoon, MF set up a rearing experiment in a well-ventilated garage with the larvae of a locally abundant flower chafer, *C. aurata* (Fremlin 2018). From mid-June 2023, nine third (final) instar larvae were kept in spent mushroom compost and shortly before the pre-pupae (mature larvae that have stopped feeding) were supposedly ready to make a cocoon, they were transferred individually to recycled old magnetic tape cassettes filled with builders' sand 70% moisture (w/w). The cassettes measured 140 × 108 × 17 mm<sup>3</sup> (L×W×H) and had an inner gap of 12 mm, which allowed for observations of their behaviour most of the time. The pre-pupae were checked regularly and weighed wherever possible (unpublished). The temperature of the garage was monitored every six hours with a HOBO® Pendant® MX Temp (MX2201) data logger.

## Observations

One of the pre-pupae behaved in a somewhat agitated way after it was moved to the sand, 20 June, probably because it was far too early. It was last weighed on 1 July when its body had a perfectly normal appearance. After that it was left undisturbed because it had started making its cocoon. However, on 7 July some water was added to the sand, which had seemed too dry. This individual was found dead two days later, 9 July, well away from a half-built cocoon; its body was black, very soft and flaccid except for the paunch which was hard.

Later, on 26 July, when re-inspecting that cassette, the corpse was rather hard; there were several faecal pellets (expected) and 12 small puparia (not expected), Figure 1. (Puparium is the hardened exoskeleton of the last larval instar of a fly.) Both pellets and puparia were saved in an Eppendorf tube.

When this tube was inspected on 30 August, there were lots of small flies and some seemed to be still alive, but they were all dead two weeks later, Figure 2. The flies were sent to RHLD who identified them as the phorid fly *Megaselia rufipes*.



**Figure 2. A sample of adult *Megaselia rufipes* and their vacated puparia, 12 September 2023. Photograph © Maria Fremlin.**

### Discussion and Conclusion

Cetoniinae larvae pupate in the substrate where they have been feeding and make hard-shelled cocoons by holding the surrounding materials with special secretions and then line them with their faeces as they empty their gut (Fremlin 2018). After that they undergo their last two moults inside the cocoon (Werner 1926, Fremlin 2020). This is the most vulnerable stage of their lives, and the cocoon is an ideal place to protect them from attack. Generally, if they do not survive one of the moults, then their corpses become dried up (MF pers. obs.).

In the unnatural situation reported above, the corpse was found away from a half-built cocoon and rather dark. Clearly this individual was in an extremely stressful situation because it was unable to build a secure cocoon with such a dry sand, hence it became very vulnerable to attack. Its cause of death was revealed later when phorid puparia were found in the cassette.

This raises the question: when did a phorid fly attack that pre-pupa? It could have been at any stage because the cassette was in no way phorid-proof. These tiny flies are known to get through the most minute places (see Reibe & Madea 2010). Besides the cassette was opened several times either to inspect the pre-pupa or to add water. The development time of *M. rufipes* from egg to pupation/pupariation varies with the temperature (Disney 2005): in a temperature range of 15 to 23 °C it could be from 6 to 15 days. After that it takes around 15 days for the flies to emerge. The average of the daily average temperature in the garage from when the pre-pupa was last weighed to when the puparia were found, (6 to 26 July), was 19.53 °C ± 2.05 °C (mean ± st.

dev.): given the development times mentioned above, the fly could have come in when the pre-pupa was last inspected, although this hypothesis cannot be proven. Nevertheless, we can safely conclude that this is a case of *M. rufipes* parasitoidism in the immature stage of a flower chafer in captivity.

### Acknowledgments

We would like to thank Davide Scaccini for reading this article and suggesting some improvements.

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