

# Recording of an exceptional aggregation of *Milesia crabroniformis* in a forest of Northern Italy

Giovanni BURGIO, Serena MAGAGNOLI

Dipartimento di Scienze e Tecnologie Agro-Alimentari (DISTAL), Università di Bologna, Italy

## Abstract

*Milesia crabroniformis* (F.) is a large hornet-mimic hoverfly considered relatively rare in Italy. During visual samplings along a transect carried out in Castiglione dei Pepoli (Bologna, Italy), with the aim of monitoring changes in hoverfly communities over sixty years, the authors observed and counted at least one hundred specimens of this hornet-mimic hoverfly while foraging on *Sambucus ebulus* L. This note aims to document this very infrequent behaviour of *M. crabroniformis* to contribute to the understanding of this phenomenon.

**Key words:** *Milesia crabroniformis*, aggregation behaviour, *Myathropa florea*, aggressive behaviour, long-term monitoring, Diptera, Syrphidae.

In this note, we are recording a peculiar phenomenon of massive aggregation of *Milesia crabroniformis* (F.) (Diptera Syrphidae) observed in the *Abies alba* Mill. forest of “Castiglione dei Pepoli” (923 m asl, Bologna, Italy) (44.13426N 11.16355E).

During visual sampling along a transect, at least one hundred specimens of this hornet-mimic hoverfly were observed foraging extensively on *Sambucus ebulus* L. flowers located at the edge of an *A. alba* formation bordering a deciduous forest of chestnut trees (*Castanea sativa* Mill.); some specimens of *M. crabroniformis* were recorded, to a lesser extent, also on the adjacent *Eupatorium cannabinum* L. flowers.

The hoverfly fauna of the *A. alba* forest in Castiglione dei Pepoli, situated in an area with unique climatic conditions atypical of the Mediterranean region (Dijkstra *et al.*, 1958), was initially studied in the 1960s (van der Goot, 1969) and resampled in the 1990s (Burgio and Daccordi, 1997); a further monitoring in this site has been started in 2023 to analyse the potential change of hoverfly communities (work in progress) during the last 60 years. The sampling survey, on which the present note is based, is part of the current monitoring program aimed at studying changes in biodiversity over time, using hoverflies as indicators.

Considering the relative rarity of *M. crabroniformis* in Italy, and the spectacular flight pattern of this large hornet-mimic hoverfly, this observation has aroused considerable interest and strong emotion among those involved in the sampling. Our intention is to record this very infrequent behaviour of *M. crabroniformis* to contribute to the understanding of this phenomenon.

We observed some specimens engaged in sexual courtship activities, although most of the local population was focused on feeding and foraging on flowers. Original photos of *M. crabroniformis* taken during our observations are reported in figures 1-2.

Near the flowers, we also observed some specimens of *Myathropa florea* (L.) (Diptera Syrphidae) exhibiting aggressive behaviour against the much larger *M. crabroniformis* (figure 3).

In addition to photo reportage, a video was also made (supplemental material - *M. crabroniformis* filmed in the *A. alba* forest of “Castiglione dei Pepoli”, credit Francesco Grazioli). A further sampling visit was carried out in mid-August, during which only a few individuals of *M. crabroniformis* were observed at the site of the earlier aggregation.

The relatively scarce floral resources in the adjacent forest in late summer might have concentrated the local population of *M. crabroniformis* on *S. ebulus*, although such an impressive aggregation of this species could be also driven by behaviour involving, possibly, specific attraction patterns (i.e., pheromones). As far as we know, such behaviour is not reported for this species, including in specialized literature.

*M. crabroniformis* is recorded in evergreen oak and deciduous forests with over-mature trees; flowers visited include, for example, *S. ebulus* and *Hedera* spp. (Speight, 2020; Maritano, 2020). Larvae of this species are considered saproxylic, being associated with decomposing wood and water-filled tree holes of mature trees, including chestnut trees (Orengo-Green *et al.*, 2023). This finding suggests a potential strong connection between the notable aggregation of *M. crabroniformis* observed in the *A. alba* forest of “Castiglione dei Pepoli” and the abundant presence of these trees in the sampled area.

Besides mimicking the colour patterns of the hornet (*Vespa crabro* L.), the buzzing sound it emits in flight is very close to that made by the hornet (Speight, 2020); in the sampling area where *M. crabroniformis* were congregated, we noted a background noise that resembled a swarm of hornets.

*M. crabroniformis* is a widespread Mediterranean species (Speight 2020; van Steenis *et al.*, 2021; Bot *et al.*, 2022; Vujić *et al.*, 2022). Dirickx *et al.* (1994) reported its presence in Piedmont, Lombardy, Trentino Alto-Adige, Marche, Calabria and Sicily. However, according to a more recent checklist in progress, it is reported in all regions with the exceptions of Aosta Valley, Friuli-Venezia Giulia, Marche, Molise, Apulia, and Basilicata (Sommaggio D., personal communication). Its presence



Figure 1-2. *M. crabroniformis* on *Sambucus* flowers (credit Serena Magagnoli).



**Figure 3.** *M. crabroniformis* and *M. florea* during the competition for resources (credit Serena Magagnoli).

is mostly associated with natural areas even if occasionally it has been found on hedgerows in rural sites (Burgio *et al.*, 1997) and near urban gardens within the city (Bologna) (Burgio *et al.*, 2015). The flight period is documented from July to October (Speight, 2020), but it is worth pointing out that *M. crabroniformis* has been observed foraging on *Hedera* sp. by one of the authors (S. Magagnoli) in late autumn (November 21, 2023) in Brisighella (Faenza, Northern Italy) (44.22449N 11.77256E). A similar behaviour was observed in *Milesia cretica* Bot et van Steenis, as reported by Bot *et al.* (2022). The authors highlighted the presence of numerous specimens in late autumn during the blooming period of *Hedera helix* L.

It would be interesting to further investigate the aggregation behaviour in *M. crabroniformis*, although such research is challenging due to the sporadic and difficult-to-predict presence of this hoverfly species.

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**Authors' addresses:** Giovanni BURGIO (corresponding author: giovanni.burgio@unibo.it), Serena MAGAGNOLI, Department of Agricultural and Food Sciences, *Alma Mater Studiorum* Università di Bologna, viale G. Fanin 42, 40127 Bologna, Italy.

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