Conclusions

La présence et la reproduction à Evere d'une toute petite population de cette espèce, pourtant inféodée aux landes, s'inscrivent dans le cadre d'autres observations « urbaines » déjà réalisées dans d'autres sites à Bruxelles. Celles-ci restent néanmoins exceptionnelles. *Chilocorus bipustulatus* est, et reste, particulièrement menacée vu la régression de son habitat de prédilection (BAUGNÉE J.-Y., 2000 ; SAN MARTIN *et al.*, 2006).

L'observation d'une espèce très rare et son suivi sur plus d'une année calendrier constituent une expérience enrichissante. En effet, l'attention portée à ce genévrier a permis non seulement de découvrir les mœurs de cette espèce de coccinelle mais également d'observer deux autres espèces.

Les conditions particulières du site (jardin-potager sans pesticides et refuge naturel, genévrier commun présentant une attaque de cochenilles, proximité immédiate du Moeraske (site classé et zone verte de haute valeur biologique)) ont probablement contribué à l'installation et au maintien de cette espèce.

Remerciements

L'auteur tient à remercier Gilles SAN MARTIN pour les informations communiquées.

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Bulletin S.R.B.E./K.B.V.E., 146 (2010) : 105-109

Microdon major Andries, 1912: another new *Microdon* species for the Belgian fauna (Diptera: Syphidae)

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Abstract

This study describes the first records of the Syrphidae species *Microdon major* ANDRIES, 1912 and the first confirmed records of *Microdon analis* (MACQUART, 1842) for Belgium. Both species can only be identified by means of larval and pupal characters, and likely by their host ant specificity: *Formica* ants for *M. major* and *Lasius* ants for *M. analis*.

Keywords: Syrphidae, Microdon, parasitism, new Belgian species, host speciation.

Introduction

Hoverflies (Diptera: Syrphidae) are renowned to display a wide variety of feeding strategies in the larval stage, including the mining of fungi and herbs, aphid predation, caterpillar predation, filtering of micro-organisms in ponds and rot holes, dead wood, sap runs, manure, etc...A particularly interesting ecological group are Syrphidae that live as commensalists or parasites in the nests of social insects, mainly wasps and ants.

The tight relationship with their hosts in the case of the parasitic subfamily Microdontinae (in Europe *Microdon* are parasites of ants) has started a co-evolutionary arms race or so-called red-queen dynamics. These dynamics may lead

to strong local adaptation to a specific ant species or even ant genome (SCHÖNROGGE *et al.* 2002), and can be the driver of speciation events. The latter likely has occurred for the cryptic species duo *Microdon mutabilis* and *M. myrmicae*: both species cannot be separated on the basis of adult morphology, but their larvae live in the nests of a different ant genus, being *Formica* and *Myrmica*, respectively. Genetic analyses revealed that they were different species and careful study of larval morphology revealed some additional characters that may be used to separate them (SCHÖNROGGE *et al.* 2002).

The study by SCHÖNROGGE *et al.* (2002) revived the interest in the taxonomy of other *Microdon* species, since it seems plausible that any *Microdon* species of which the larvae occur with multiple ant genera may be in fact a species complex, with a different cryptic species associated with each of the ants involved (SPEIGHT 2008). The first species to be tackled was *Microdon analis* (MACQUART, 1842) (=*Microdon eggeri* MIK, 1897). This species was known to occur together with both *Formica* and *Lasius* ants. Moreover, a historical detailed study by ANDRIES (1912) revealed the presence of slight differences in pupal morphology within *Microdon analis*, which she described as the variation *M. eggeri* var. *major* Andries, 1912. DOCZKAL & SCHMID (1999), not aware of the ongoing seminal research of Schönrogge and his colleagues, synonymized *M. eggeri* var. *major* with *M. analis*. In the light of the findings by SCHÖNROGGE *et al.* (2002), SCHMID (2004) restudied the material left by Andries and instated the taxon *M. eggeri* var. *major* as a novel species *Microdon major* ANDRIES, 1912. The main morphological differences between *M. analis* and *M. major* reported in SCHMID (2004) are:

- In both larvae and pupae, the posterior spiracular process is short and broad in *M. major*, and high and slender with slightly conical walls in *M. analis*. In *M. major* the spiracular plate extends further and is medially deeper notched.
- anterior respiratory horns are broader and conical in *M. major* but slender and parallel sided in *M. analis*.
- *M. major* on average is bigger than *M. analis*: for pupae the size range is 7-10 mm in *M. analis* and 9-10,5 mm in *M. major*. *M. major* pupae also are generally darker than those of *M. analis*.

Following the publication of SCHMID (2004), *M. major* have been found also outside Germany such as in France (DUSSAIX *et al.* 2007), yet, in many countries further investigations are needed in order to confirm the species' presence. *M. analis* reported from nests of *Formica* ants in the U.K (SPEIGHT 2008) and the Netherlands (www.waarneming.nl) probably also refer to *M. major*.

During 2009, special attention was given by the first author to assessing the presence of different *Microdon* species in Belgium. Previously, three species were known from Belgium: *M. analis*, *M. devius* and *M. mutabilis* (VERLINDEN & DECLEER 1987). Following the study of museum collection material, and the search for larvae, both *M. mutabilis* and *M. myrmicae* were shown to occur in Belgium (VAN DE MEUTTER *et al.* 2009). The record of *M. mutabilis* sensu SCHÖNROGGE *et al.* (2002) was erroneously mentioned to be the first confirmed record of *M. mutabilis* from mainland Europe, yet, ANDRIES (1912) described the species *M. rhenanus* from western Germany which was formally synonymized with *M. mutabilis* by DOCZKAL & SCHMID (1999). Concerning *M. major*, no indications for its presence in Belgium were known prior to this study. Also, never before *M. analis* has been formally identified based on pupal or larval characters, which is needed for reliable identification.

Material and methods

A specific search for *M. major* was performed in the Hautes Fagnes area with an emphasis on the region around Rocherath in the Belgian Eifel. We experienced that the most efficient strategy for finding larvae of *Microdon* was to look for patrolling males. *Microdon* males seemed to await the emergence of females within very close proximity of the ant's nests (often < 1m) and to chase and grab emerging females to copulate even before they had hardened their integument (F. Van de Meutter & P. Vantieghem, pers. observ.). Carefully opening these nests nearly always revealed the presence of *Microdon* puparia. Pupae were collected and examined against existing literature (SCHMID 2004, SPEIGHT 2008) for identification. Collected adults and pupae are kept in the collection of F. Van de Meutter.

Fig. 1: Pictures of the location near Rocherath where *M. major* was found, showing the rotten tree trunk, and a detail of a *Formica sanguinea* with empty *M. major* puparium. (Photos F. Van de Meutter; photo *F. sanguinea* by P. Vantieghem).

Results

On 23.V.2009, we found four males of *Microdon* of the *analis* group that were sitting on and next to a rotten tree trunk along a path through forest in the Jansbach river valley at Rocherath (see Fig. 1). Both black *Lasius* ants and *Formica* ants were found on the ground near the trunk. When opening the tree trunk, a nest of *Formica* was revealed, in which a large number of pupae were present. We counted 18 pupae in the upper part of the nest that we opened, but likely more were present elsewhere in the nest. Pupae of *M. major* were distinctly larger than *M. analis* pupae collected at other locations in 2009 and 2010 (see Figs. 2, 3). Comparing the shape of the posterior spiracular process and the anterior respiratory horns with *M. analis* found in Maasmechelen clearly showed the differences as described above (based on SCHMID 2004) (see Figs. 4, 5). Some *Formica* ants were collected and later identified as *F. sanguinea*. At subsequent visits to the same site on 13.VI.2009 (F. Van de Meutter) and 17.VI.2009 (J. Mortelmans & P. Vantiegem), each time one

Fig. 2: Side and top view of *M. major* pupa, Rocherath, 23.V.2009. (Photos F. Van de Meutter).

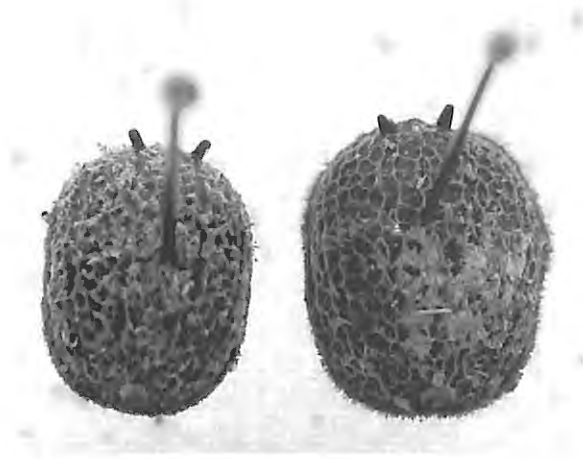

Fig. 3: Top view of *M. analis* (left, Maasmechelen, 30.III.2009) and *M. major* (right, Rocherath, 23.V.2009) pupae. (Photos F. Van de Meutter).

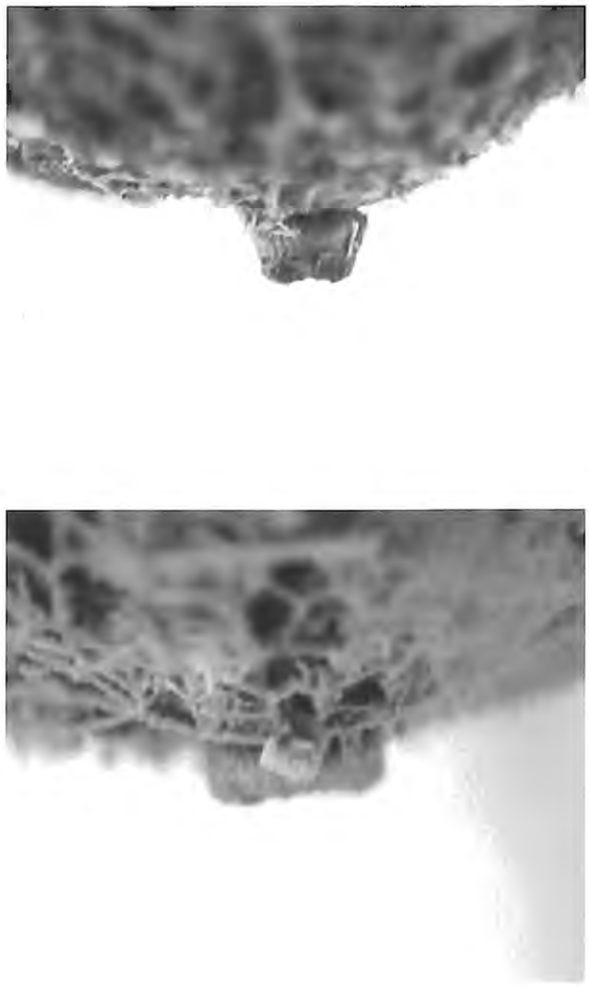

Fig. 4: Pictures of the posterior spiracular process of *M. analis* (above) and *M. major* (below). Pupae are the same as in Figure 3. Note the difference in the shape of the process; low and broad in *M. major*, and high and slender with conical walls in *M. analis* (Photos F. Van de Meutter).

individual of presumably a *M. major* was seen sitting near the entrances of the *F. sanguinea* nest (Fig. 6).

During March-June 2009, we also succeeded in finding *Microdon* pupae that were later identified as *M. analis* at four locations: Maasmechelen, Eupen, Jalhay and Recht. All were found in black *Lasius* ants nests in tree trunks or stumps. The number of pupae found in the nests ranged from 2-7. One older confirmed record of *M. analis* larvae is known from Libin (20.V.2006, leg. & det. J. van Steenis), also from a black *Lasius* nest in a tree stump.

Discussion

This study confirms the presence of *M. analis* in Belgium, based on pupal characters, and reveals the presence of yet another *Microdon* species for Belgium: *M. major*. So at present five species of *Microdon* are known from Belgium. A sixth *Microdon* species, belonging to the the *analis* group, – *M. miki* – may be present in Belgium, but was hitherto not confirmed.

It is unclear how widespread *M. major* may be in Belgium. Our limited search efforts so far indicate that the majority of *M. analis* (or *M. eggeri*) so far reported in Belgium likely will be *M. analis* s.s.. *M. major*'s association with *Formica* ants (mainly *F. sanguinea* and to a lesser extent some other species of the *F. rufa* group, SCHMID 2004) makes that its potential range in Belgium is much smaller than that of *M. analis* that occurs with the commoner black *Lasius* ants. In addition, the majority of the *Formica rufa* group ants are listed as vulnerable following a major decline the past decades (DEKONINCK *et al.* 2003).

When present, *M. major* may be relatively abundant, given the large number of pupae retrieved from one *Formica* nest. Living with large *Formica* obviously provides *M. major* with a food bonanza compared to *M. analis* that feeds on much smaller ant species that may occur in smaller colonies too. This may explain their bigger size and the large number of pupae found in one nest, if this pattern may be generalized from our restricted dataset.

Finally, we like to encourage people that find adult *Microdon* to also try finding the larval stages, to confirm its specific identity and improve our knowledge on the distribution of the different species in Belgium. We advocate each time collecting some of the ants to further

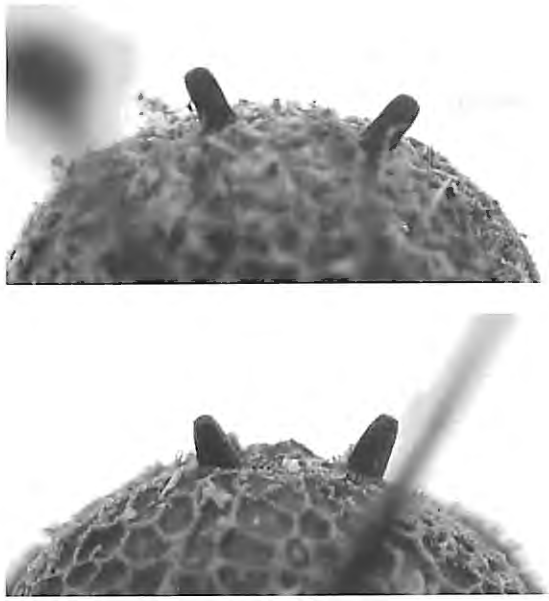

Fig. 5: Pictures of the anterior respiratory horns of *M. analis* (upper panel) and *M. major* (lower panel). Pupae are the same as in Figure 3. Note that in *M. major* the horns are conical; in *M. analis* they are parallel-sided. (Photos F. Van de Meutter).

Fig. 6: Picture of a presumed *M. major* sitting next to the *F. sanguinea* nest (Photo P. Vantieghem).

establish host-parasite associations in this peculiar Syrphidae genus. Searching for larvae, however, should be done with respect and minimal disturbance to the ant colonies.

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