Chrysogaster rondanii Maibach & Goeldlin de Tiefenau, 1995 in Belgium: diagnosis, ecology and distribution (Diptera: Syrphidae)

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Abstract

This article provides an overview of all records of *Chrysogaster rondanii* Maibach & Goeldlin de Tiefenau, 1995 in Belgium. The phenology and habitat are discussed and compared with its sibling species *Chrysogaster virescens* Loew, 1854. A series of illustrations of males and females of both *C. rondanii* and its sibling species *C. virescens* are presented to assist with identification.

Keywords: Syrphidae, *Chrysogaster*, broad-leaved woodland, aquatic larva.

Samenvatting

Dit artikel geeft een overzicht van alle Belgische waarnemingen van *Chrysogaster rondanii* Maibach & Goeldlin de Tiefenau, 1995 (NL: breedkopdoflijfje). Verder worden gegevens over de fenologie en de habitat van *C. rondanii* besproken en vergeleken met de zustersoort *Chrysogaster virescens* Loew, 1854. Tenslotte worden afbeeldingen van sleutelkenmerken van zowel mannetjes als vrouwtjes van *C. rondanii* en *C. virescens* getoond als ondersteuning bij het op naam brengen van deze soorten.

Résumé

Dans cet article sont présentées les observations de *Chrysogaster rondanii* Maibach & Goeldlin de Tiefenau, 1995 en Belgique. Sa phénologie et son habitat sont discutés et comparés avec ceux de *Chrysogaster virescens* Loew, 1854, espèce très proche de *C. rondanii*. Une série d'illustrations du mâle et de la femelle de ces deux espèces sont fournies afin de faciliter leur identification.

Introduction

Chrysogaster are relatively small, black or blue-greenish flies. They are distinguished from the very similar looking *Melanogaster* by their reddish antennae (MAIBACH *et al.*, 1994). In Belgium three species of *Chrysogaster* are listed by VERLINDEN (1991): *C. cemiteriorum*, *C. solstitialis* and *C. virescens*. VAN DE MEUTTER (2011) lists a fourth species for the Belgium fauna, *C. rondanii*, based on 2 male specimens caught in a Malaise trap at Hechtel, prov. Limburg (1-6.VI.1996; det. Guy Van de Weyer). *C. rondanii* was separated from the similar looking *C. virescens* by MAIBACH & GOELDLIN DE TIEFENAU (1995). Due to its relatively recent description, the distribution of *C. rondanii* in Europe remains poorly known. It is reported from the Netherlands, Germany, France and Switzerland. Outside Europe *C. rondanii* has been reported from Iran (KHAGHANINIA *et al*., 2012). In the Netherlands *C. rondanii* has been caught in numbers in the past, mainly in the surroundings of Breda, yet recent observations are much scarcer, and this species is believed to be in decline. For Belgium, additional observations were performed during the past decade, however, the large collection at the Royal Belgian Institute of Natural Sciences museum (RBINS, Brussels) had not been revised. Among Belgian observers, for a long time confusion remained on the identification of *C. rondanii*. One cause for this is the lack of illustrations of the important discriminative characteristics with respect to its sibling species *C. virescens*, both in keys and on the internet. With this paper I want firstly to investigate the historical and present distribution and habitat affinity of *C. rondanii* and

compare this with that of *C. virescens* and secondly to discuss the characteristics that are used to identify this species, and provide illustrations of key ID-features, to resolve ongoing confusing about *C. rondanii*.

Material and methods

In the collection of the RBINS (Brussels) I revised all Belgian material present of the genera *Chrysogaster* and *Melanogaster*. In addition, a selection of observers were asked for further information on existing observations when there existed reasonable doubt on the identification, date or location of observations of *C. rondanii* or *C. virescens*, or to request further habitat information. Data of the Belgian Syrphidae database (BELSYRPHDAT) were used to study the phenology and distribution of both *C. rondanii* and *C. virescens*. High-resolution macrophotographs were taken with a LEICA MC170 HD camera mounted on a LEICA S8APO stereomicroscope.

Results

Overview of the records

Oost-Vlaanderen: Schelderode, ES54A, 16.V.1942, 1♀, leg. Verbeke J., det. Van de Meutter F., coll. RBINS; Melle, 11.V.1938, 1♀, leg. Bequaert M., det. Van de Meutter F., coll. RBINS; Melle, "bois", 6.V.1942, 1♀, leg. Bequaert M., det. Van de Meutter F., coll. RBINS; Melle, 19.IV.1950, 1♀, leg. Verbeke J., det. Van de Meutter F., coll. RBINS; Melle, 12.V.1950, 1♀, leg. Verbeke J., det. Van de Meutter F., coll. RBINS; Melle, "bois", 27.IV.1955, 2♂, leg. Bequaert M., det. Van de Meutter F., coll. RBINS; Kruishoutem, Lozerbos, ES34D, 27.V.2005, 1♀, leg. Geiregat N., det. Geiregat N., coll. Geiregat N.; Merelbeke, Makegemse bossen, ES54C, 24.IV.2013, 1♂, leg. Vantieghem S., det. Van de Meutter F., coll. Vantieghem S.; Merelbeke, Gentbos, ES54A, 12.IV.2015, 4♂+1♀, leg. Vantieghem S., det. Vantieghem S., coll. Vantieghem S.; Merelbeke, Gentbos, ES54A, 15.IV.2015, 11♂+3♀, leg. Mortelmans J., det. Mortelmans J., coll. Mortelmans J.; Merelbeke, Heilig Geestgoed (Bruinbos), ES54C, 15.IV.2015, 2♂, leg. Mortelmans J., det. Mortelmans J., coll. Mortelmans J.; Merelbeke, Makegemse bossen, ES54C, 15.IV.2015, 4♂+2♀, leg. Mortelmans J., det. Mortelmans J., coll. Mortelmans J. **Limburg**: Hechtel, militair domein, FS66B, 25.V-1.VI.1995, 2♂ (Malaisetrap), leg. Crevecoeur L., det. Van de Weyer G., coll. Van de Weyer G. (VAN DE WEYER, 2002) **Hainaut:** Chimay, Lac de Virelles - west side of the lake, ER94B, 29.IV-5.V.2006, 1♂+1♀ (Malaisetrap), leg. Pierret S., det. Van de Meutter F., coll. Van de Meutter F.; Chimay, Lac de Virelles - west side of the lake, ER94B, 19.IV.2010, 1♂, leg. Vantieghem P., det. Vantieghem P., coll. Vantieghem P.; Chimay, Lac de Virelles - west side of the lake, ER94B, 4.V.2014, 1♂+2♀, leg. Van de Meutter F., det. Van de Meutter F., coll. Van de Meutter F., Chimay, Lac de Virelles - west side of the lake, ER94B, 12.V.2015, 20♂+5♀, leg. Mortelmans J. & Opdekamp W., det. Mortelmans J. & Opdekamp W., coll. Mortelmans J. & Opdekamp W. **Luxembourg**: Châtillon, Camp militaire - Mer de sable, FR90C, 2♂, 16.V.2005, leg. Baugnée J.Y., det. Baugnée J.Y., coll. Baugnée J.Y.

In the RBINS collection seven *C. rondanii* were found. Four were misidentified as *C. coemiteriorum*, three as *C. virescens*. All specimens were collected in the area south of Gent between 1938 and 1955 by J. Verbeke and M. Bequaert. Of the records of *C. virescens* illustrated in the distribution maps by VERLINDEN (1991) south of Gent, none remains. Since 2005, two observations of *C. virescens* have been reported from this area (Kruishoutem and Merelbeke) however, after questioning the observers, both proved to be *C. rondanii*. More recently, single records of *C. rondanii* have become available from Hechtel and Châtillon. A series of observations were done at the Lac de Virelles near Chimay, following the discovery of this species in a Malaise trap. After the presence of *C. rondanii* in the surroundings of Merelbeke became known, a targeted search during spring 2015 revealed its presence in good numbers in several forest fragments in the area. Lastly, on the internet several reports of *C. rondanii* in the Hautes Fagnes area have been published. When voucher specimens of these observations were available to the author, they turned out to be *C. virescens*. The author has collected over 300 *C. virescens* on several occasions from all over the Hautes Fagnes, but no *C. rondanii* has been found. Until proof is provided, records from this area are not withheld. The currently known distribution of *C. rondanii* and *C. virescens* in Belgium is shown in figure 1a, b.

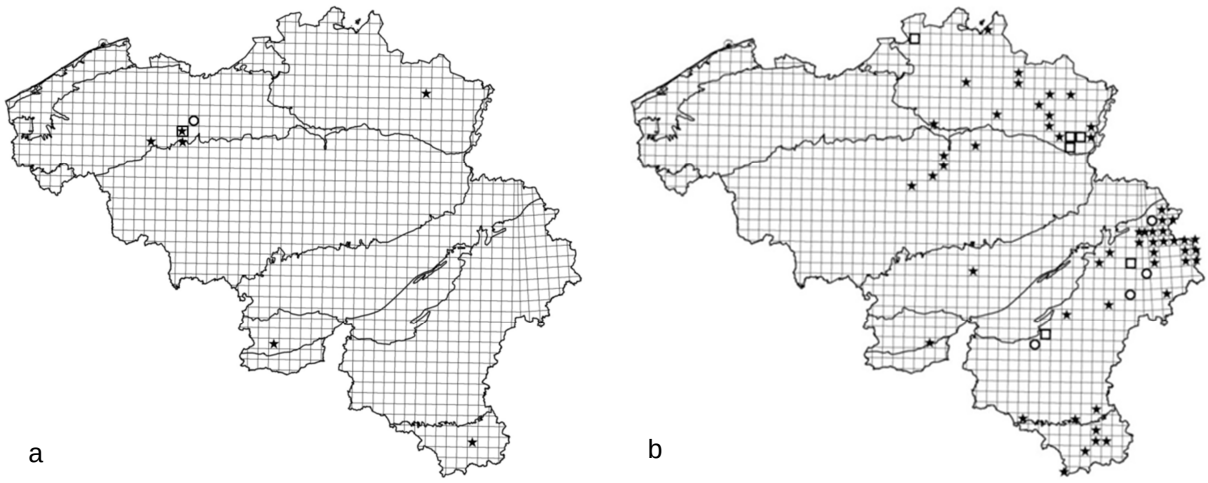

Fig. 1. The distribution of *C. rondanii* (a) and *C. virescens* (b) in Belgium at the level of 5x5 km UTM squares. The lines within the limits of Belgium delineate ecoregions. □: records dating before 1950, ○: records between 1950-1980, ★: records from 1980 till present.

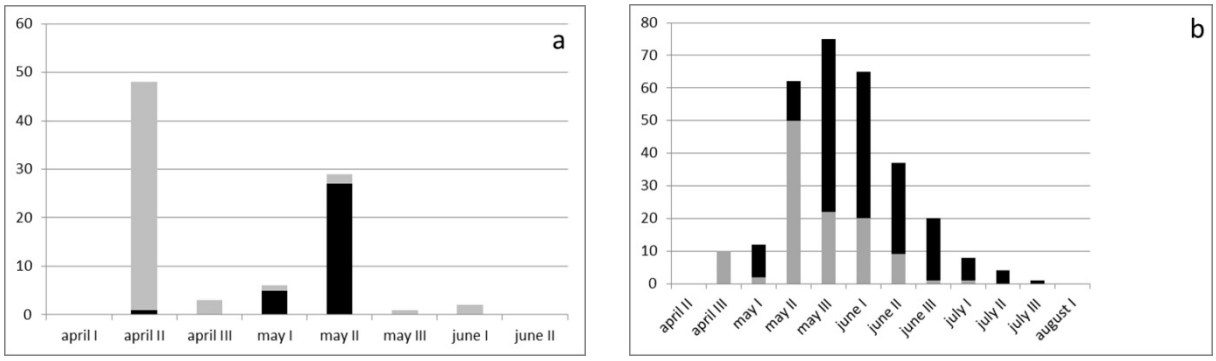

Fig. 2. Phenology graphs of *C. rondanii* (a) and *C. virescens* (b) in Belgium. Records in Flanders and Wallonia are shown in grey and black, respectively.

Ecology

The phenology of *C. rondanii* is given in figure 2a. The median flight date of *C. rondanii* is April 18th. The median flight date of males is 18 days earlier than for females (April 16th for males, May 4th for females). The phenology diagram exhibits two distinct peaks which correspond to Flemish (earlier) and Wallonian (later) records. The diagram is still highly influenced by a small number of records, yet at least the Flemish pattern is confirmed by frequent visits over a long period in spring 2015 and by numerous null-records outside the reported observations. For comparison, the phenology of *C. virescens* in Belgium is given in Figure 2b. The median flight date of *C. virescens* (both sexes) is 1 June. If we restrict the records to Flanders, the median flight date shifts to 20 May. The median flight date of male *C. virescens* in Flanders is 18 days earlier than for females (data not shown).

Specimens collected by Goetghebuer at Melle bare the locus "bois", French for woodland. All specimens collected at Virelles were caught in or at the edge of *Quercus*-dominated woodland with ample ditches where calcium-rich seepage surfaces. At Merelbeke it was found at the edge of a broad-leaved woodland; idem at Kruishoutem. *C. rondanii* were caught on *Prunus spinosa* (8 records), *Crataegus sp.* (4), and *Sorbus aucuparia* (2).

The habitat of *C. rondanii* in Belgium is moist broad-leaved woodland on (sand-)loamy soils. Locally seepage is present. The observation at Hechtel bears no precise habitat information but the larger area is a heathland with acid fens, very different from the other sites.

Fig. 3. Macrophotographs of male *C. rondanii* (a-c) and *C. virescens* (d-f) showing important characters for identification. a, d: the lateral view on head and mesoscutum; b, e: frontal view of the head; c, f: drawings of the surstyli based on own observations and the figures in MAIBACH & GOELDLIN DE TIEFENAU (1995).

Diagnosis

A considerable proportion of *C. rondanii* in collections were misidentified. This is evident for records that predate 1995 when *C. virescens* and *C. rondanii* were regarded monospecific. However, errors occurred frequently for later records as well, even with experienced observers. This me be due to some erroneous or vague descriptions in current keys, which require further clarification or illustration. Table 1 summarizes the main differences between *C. virescens* en *C. rondanii* that in my experience can be best used for identification. For *C. rondanii*, VAN VEEN (2004) states "*male thoracic dorsum and scutellum covered with long erect, black hairs*", whereas for *C. virescens* it says "*male thoracic dorsum covered with semi-erect, light hairs*". We found no difference in the colouration of the hairs in Belgian material, and neither is this difference highlighted by MAIBACH & GOELDLIN DE TIEFENAU (1995). The hairs are dark-brown in both species. The difference in the inclination of the hairs is taken over from MAIBACH & GOELDLIN DE TIEFENAU (1995), however, we find this character highly variable. The hairs on the thoracic dorsum of *C. rondanii* and *C. virescens* males are flexible, and may bend as a result of netting or subsequent handling of specimens. The majority of misidentifications of males *C. virescens* (as *C. rondanii*) were based on these traits (pers. comm. by several observers). The prominence of the facial knob clearly differs between *C. rondanii* and *C. virescens*, and even more clearly so does facial width (broader in *C. rondanii*, see Fig. 3). This trait is not illustrated in current keys, therefore it remains prone to subjective and incorrect interpretation, again leading to misidentifications. Lastly, the shape of the surstyli is different between both species. This difference is illustrated in MAIBACH & GOELDLIN DE TIEFENAU (1995) but has not been retained in the commonly used keys and therefore we here add a (schematic) illustration.
Female *C. rondanii* were misidentified as *C. virescens*, but also as *C. cemiteriorum*. Confusion with the last species may have occurred because the wings of *C. rondanii* may have a slightly yellowish wing basis. *C. rondanii* females differ from *C. virescens* females in having a pubescent thorax, scutellum and frons (no hairs in *C. virescens*). The overall appearance of *C. rondanii* is different in being much less shiny than *C. virescens*. The overall colour is more green-brown, while it is resplendent blue-green in *C. virescens* (Fig. 4).

Fig. 4. Macrophotographs of female *C. rondanii* (a, b) and *C. virescens* (c, d) showing important characters for identification. a, c: lateral view on head and mesoscutum; b, d: detail of the mesoscutum.

Table 1. Schematic overview of trait differences between males and females *C. rondanii* and *C. virescens*. The majority of traits are illustrated in Figures 3, 4.

MALES		
Trait	***C. rondanii***	***C. virescens***
Surstylus shape	Inner side of the surstylus a smooth curve to the apex	Inner side of the surstylus with a clear notch
Hairs on thoracic dorsum	Dark, brown-black. Slightly reclined.	Dark, brown-black. Long series show on average more reclined hairs than in *C. rondanii*, yet inclination is much less than 45°. At the individual level highly variable.
Facial knob	Indistinct, broad	More prominent
Face width	Broad, ratio of width of the head/ width face under antennae = 2.6-2.7	Less wide, obvious in comparison with *C. rondanii*
Frons	Faintly shiny, densely punctuated	Brilliantly shiny, less densely punctuated
General colouration and appearance	Bronze-green with purple-coppery tinges. In direct comparison with *C. virescens* somewhat less shiny, more bronzy, yet difference is subtle.	Bronze-green, with purple-coppery tinges.
FEMALES		
Trait	***C. rondanii***	***C. virescens***
Thoracic dorsum	Short, whitish hairs on scutum and scutellum, clearly visible	Glabrous; at most some scattered very short hairs
Hairs under abdominal sternite 1	equal to width of femur 3	Shorter than width of femur 3
Frons	With white hairs	Glabrous
General colouration and appearance	Bronzy-green with brownish tinges. Weakly brilliant	Green or blue-green. Brilliant.

Discussion

C. rondanii is a rare species in Europe. In France it is known from recent records only in three departments in the mid and west (Ain, Manche and Sarthe; SARTHOUT *et al*., 2010). In the Netherlands *C. rondanii* is known from nine different sites, but only three have observations after 1990 (REEMER *et al*., 2009). Further it is known from Germany and Switzerland. It has been reported recently from outside Europe in Iran (KHAGHANINIA *et al*., 2012), but the illustrations in this paper show a rather atypical *C. rondanii* male compared to the Western-European material I have seen. In the Netherlands there are indications of a decline of *C. rondanii*. Around its historical stronghold around Breda several tens of individuals have been collected for some decades, but it has not been found there recently. In Belgium *C. rondanii* occurs very localised. The historical (meta?)population south of Gent is persisting and new populations have been discovered in that area recently. Apart from this stronghold, a large population is present at Virelles.

C. rondanii occurs in broad-leaved forest with seepage (REEMER *et al*., 2009) or in open areas along small brooks in humid *Fagus/Picea* and *Fraxinus/Fagus* forest (SPEIGHT, 2010). In France it is found in or along large forests (SARTHOU *et al*., 2010). Larvae of *Chrysogaster* are (semi)-aquatic, and probably *C. rondanii* is associated with seepage areas in forest. The above habitat description largely fits the Belgian observations. The habitat description partly overlaps with that of *C. virescens*: this species is found in two distinct habitats in Belgium: moist broadleaved woodland, and acid fen carr (often with *Sphagnum*). One record of *C. rondanii* at Hechtel indicates that it may as well occur at acid fen and Sphagnum bogs, yet, these habitats have been intensively searched the past decade yielding hundreds of *C. virescens* and no *C. rondanii*. We therefore consider this an aberrant record, for the time being.

Although *C. rondanii* and *C. virescens* can occur in very similarly looking woodlands, they do not occur together in Belgium, suggesting they have a different niche. In Wallonia, *C. rondanii* is found together with another very rare species: *Melanogaster parumplicata*, a closely related species with a similar larval life-style that may prefer the same microhabitat (carbon-rich seepage?). Adults of *C. rondanii* have been caught on *Crataegus*, *Cytisus*, *Ilex*, *Prunus avium, P. spinosa* and *Sorbus aucuparia* (REEMER *et al*., 2009, SPEIGHT, 2010). This accords to the Belgian observations. A preference for flowering bushes is apparent. In Belgium *C. rondanii* is on the wing from half of April to the end of May. Both *C. rondanii* and *C. virescens* are distinctly protandrous. *C. rondanii* is on average one month earlier on the wing than *C. virescens*.

C. rondanii is poorly represented in current literature. It was long confused with *C. virescens* and therefore lacks from older keys, but also from several recent regional keys because authors seem to defy the possibility that this species may occur in their specific region (e.g. BARTSCH *et al*., 2009). Even more striking is the near absence of illustrations of this species, which may compromise successful identification of this species. Some of the identification features mentioned in current keys do not apply in all cases, or can only be used with reference to *C. virescens* or good illustrations. I hope this paper clarifies some of this confusion.

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