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The discovery of three spectacular robber flies new to Belgium (Diptera: Asilidae)

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Abstract

This paper reports the first observations of *Leptarthus vitripennis* (Meigen, 1820), *Choerades fuliginosa* (Panzer, 1798) and *Choerades ignea* (Meigen, 1820) in Belgium, raising the number of Belgian Asilidae to 52. *Leptharthus vitripennis* and *C. fuliginosa* were found in the Belgian Lorraine region, in the southernmost part of Belgium, during a 5-day field campaign. *Choerades ignea* was found in the Belgian Campine region. Ecology, habitat preference and some notes on distribution in neighbouring countries of all three species are discussed in detail.

Keywords: Asilidae, Belgium, *Choerades fuliginosa*, *Choerades ignea*, *Leptharthrus vitripennis*, robber flies

Samenvatting

Dit artikel beschrijft de eerste Belgische vondsten van *Leptharthus vitripennis* (Meigen, 1820), *Choerades fuliginosa* (Panzer, 1798) en *Choerades ignea* (Meigen, 1820). Deze vondsten doen het aantal soorten roofvliegen in België toenemen tot 52. *Leptharthus vitripennis* en *C. fuliginosa* werden gevonden gedurende een vijfdaagse excursie in de Gaume streek in Zuid-België. *Choerades ignea* werd gevonden in de Antwerpse Kempen. Ecologie, habitatpreferentie en verspreiding in naburige landen van de drie soorten worden in detail besproken.

Résumé

Cet article rapporte les premières observations belges de *Leptharthrus vitripennis* (Meigen, 1820), *Choerades fuliginosa* (Panzer, 1798) et *Choerades ignea* (Meigen, 1820). Ces observations portent à 52 les espèces d'Asilides belges. *Leptharthrus vitripennis* and *C. fuliginosa* ont été trouvées dans la région de la Gaume dans le sud de Belgique pendant une excursion de cinq jours. *Choerades ignea* a été trouvé dans la région Campine. L'écologie, préférence d'habitat et distribution dans des pays voisins des trois espèces sont discutées en détail.

Introduction

Robber flies (Diptera: Asilidae) are striking flies with highly predatory habits, chasing or ambushing other invertebrates. Several well-illustrated keys for the Belgium, The Netherlands and Germany are available (VAN DEN BROEK & SCHULTEN, 2017; VERLINDEN, 1982; WOLFF *et al*., 2018) and the family is receiving more and more attention from entomologists (with many publications by Guy Tomasovic in the '90s, e.g. TOMASOVIC (1995, 1998), reporting on the Belgian fauna). In 2017, VAN DEN BROEK & SCHULTEN gave Dutch names to all species of Asilidae occurring in Belgium and The Netherlands,

thus enabling the communication on Asilidae to the broader non-scientific public and increasing attention to this family.

Despite thorough research on Asilidae, the distribution of these flies in Belgium, especially in the Walloon region and near the river Meuse, seems to be insufficiently known and is probably still evolving. After the many publications by Tomasovic, attention to Belgian Asilidae seemed to temper. From the Netherlands, some interesting observations and new arrivals were recently published, indicating the family still might harbour some surprises also in Belgium (DE BREE *et al.,* 2014; VAN VEEN & VAN AARTSEN, 1998). Currently 49 species of Asilidae are known to Belgium (VAN DEN BROEK & SCHULTEN, 2017, VAN DEN BROEK *et al*., 2018). This includes *Tolmerus calceatus* (Meigen) which was recently confirmed to be a valid species (VAN DEN BROEK *et al.,* 2018).

Material and methods

Since 2013 *Choerades ignea* is known from the Netherlands, followed by a steep increase in observations (DE BREE *et al.,* 2014). This increase is most likely due to a range expansion as the number of observations of sister species *C. gilva* stayed relatively constant during the past 100 years in the Netherlands. *C. ignea* on the other hand, was collected for the first time (and misidentified) in 1993 in the eastern part of the Netherlands and has been observed on a yearly basis since 2013, showing a southwards expansion (DE BREE *et al.,* 2014). Consequently, this species was expected to turn up in the Belgian Campine region, which encouraged the last two authors to pay special attention to this species in this region. Several field trips were conducted in suitable habitats.

In addition, in July 2016, the first four authors set out for a five-day excursion in the Gaume region, the southernmost part of Belgium, in search of interesting Diptera.

Results

Choerades fuliginosa (Panzer, 1789) new to Belgium

MATERIAL EXAMINED: Belgium, Province Luxembourg: Vallée de la Chevratte, Bellefontaine (49.635 N, 5.484 E), 9.VII.2016, 1 ♂ 2 ♀ , leg. & det. J. Hendrix, J. Mortelmans, M. Boeraeve, W. Tamsyn, coll. J. Mortelmans; Vallée de la Chevratte, Bellefontaine (49.635 N, 5.484 E), 10.VII.2016, leg. det. J. Hendrix, J. Mortelmans, M. Boeraeve, W. Tamsyn; Meix-devant-Virton (49.610 N, 5.481 E), 11.VII.2016, 1 ♀, leg. & det. J. Hendrix, J. Mortelmans, M. Boeraeve, W. Tamsyn, coll. J. Mortelmans.; Harinsart, 24.VI.2018, 1 ♀, leg. J.-L. Renneson, det. J. Mortelmans.

Choerades is a part of the Laphrinae subfamily of which species are often large, hairy, and colourful, resembling bees or bumblebees. They can morphologically be distinguished from other robber flies by the arista, which is very small and sometimes even absent, and this arista (if present) is implanted on the side of the postpedicel. Further characters include the laterally flattened proboscis, and the closed cell R_1. A complete review on the subfamily was published by PAPAVERNO (1973). The subfamily exhibits a unique larval development strategy: where most Asilidae have a larval stage underground, the larvae of Laphrinae, for which the biology is known, have a predatory ecology in dead wood (STUBBS & DRAKE, 2014).

Until now three species of *Choerades* were known to Belgium: *C. marginata* (Linnaeus, 1758), *C. gilva* (Linnaeus, 1758) and *C. fulva* (Meigen, 1804). *C. marginata* is very common and found in various habitats throughout the country. This species does however belong to a species complex that, depending on the authors, consists of one to three species: *C. marginata* (Linnaeus, 1758), *C. femorata* (Meigen, 1804) and *C. dioctriaeformis* (Meigen, 1820) (WOLFF *et al.,* 2018). A revision is needed to determine which of these are currently present in Belgium. *C. gilva* is very rare and restricted to the Antwerp and Limburg provinces where it favours pine rich areas [i.e. the Campine region]. Old records suggest a wider range for this species, including the region around Brussels and the Ardennes region. However recent sightings in these areas are lacking (E. De Bree & J. Mortelmans pers. comm.; based on reidentified collection material in the Royal Belgian Institute of Natural Sciences, RBINS). As there is doubt about the taxonomic status of *C. fulva* and considering the rarity of the species (only

one record from 1900) and similarity to *C. fimbriata,* they will be treated together in this manuscript. From the Netherlands an additional species is known: *C. ignea* (Meigen, 1820), which is rapidly expanding on the Dutch higher sand grounds (DE BREE *et al.,* 2014).

Although *C. fuliginosa* is similar to other species of the genus, it is a much hairier, more bee-like animal with relatively long antennae, reminiscing a bee of the genus *Osmia*. A reliable character is the scapus that is at least twice the length as the pedicel, and the postpedicel which is as long as the first two segments combined (WOLFF *et al*., 2018; VAN DEN BROEK & SCHULTEN, 2017). Furthermore, the humeri of *C. fuliginosa* are shiny, whereas in *C. marginata* the humeri are dusted, contrasting with the rest of the notopleuron which is shiny. (GELLER-GRIMM, 2018, VAN VEEN, 1996). Other species in the genus *Choerades* which have been recorded in Belgium and the Netherlands can be distinguished by the extensive reddish hairs on the abdomen (*C. gilva*, *C. ignea,* and *C. fulva*) or by the presence of lateral setae on the hind margins of the tergites (*C. marginata*) (GELLER-GRIMM, 2018). Additional characters to confirm the identification of *C. fuliginosa* are the darkened wing-centre and tip and the slightly brownish tips of the epandrium arms in the male genitalia. An overview how to exclude other species of *Choerades* is found in the online keys by GELLER-GRIMM (2018).

Choerades fuliginosa was found on three consecutive days, at two locations about 3 km apart in a valley covered with deciduous forest interspersed with some *Picea*-stands (Fig. 1). They were found in clearings, resting on bramble leaves. The whole region is characterised by calcareous soils and a high amount of insect species typically associated with these habitats is known from this valley, eg. *Coremacera fabricii* (Rozkosny 1981), *Oxycera pygmea* (Fallen, 1817), *Stratiomys chameleon* (Linnaeus, 1758) (MORTELMANS *et al*., 2012). *C. fuliginosa* was always seen in numbers, indicating good populations are present throughout the valley, and it is expected to be reasonably common in the forest complex between Florenville and Arlon. Just prior to publication a picture of an unidentified fly was send to us by J.L. Renneson, identified by us as *C. fuliginosa.* This observation was made in Harinsart, only few kilometres away from the other observations.

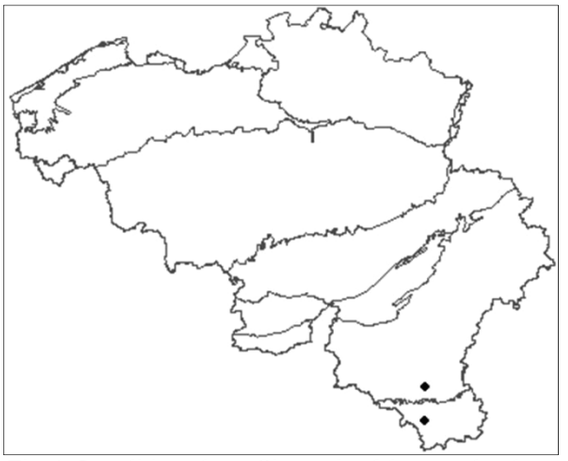

Fig. 1. Localities where *Choerades fuliginosa* has been found in Belgium.

Although *C. fuliginosa* is only rarely reported in literature, it is known from large parts of Europe: Albania, Armenia, Austria, Bosnia and Herzegovina, Bulgaria, Czech Republic, Finland, France, Germany, Greece, Caucasus region, Poland, Romania, Russia, Slovakia, Slovenia, Spain, Switzerland, Sweden, Turkey, Yugoslavia (GELLER-GRIMM, 2003.; BYSTROWSKI *et al*., 2015). In Germany, it is a very rare species, distributed in the central and southern parts of the country, with some observations near Luxemburg (WOLFF *et al*., 2018). In France, there are much more observations of *C. fuliginosa,* often unpublished and found on various internet fora. The species is therefore not considered endangered at any level. Confirmed observations from abroad indicate the species is most often seen between the beginning of June and the end of August.

Choerades ignea (Meigen, 1820) new to Belgium

MATERIAL EXAMINED: Belgium, Province Antwerpen: Landschap de Liereman – Hoge Mierdse Heide (51.328 N, 5.015E), 18.VIII.2018, 1 ♀, leg. det. & coll. W. Opdekamp.

In the Netherlands *C. ignea* was recognized for the first time in 2013. A recent check of all specimens of *C. gilva* and *Laphria flava* (Linnaeus, 1761) in the collections of Naturalis (Leiden) revealed two older Dutch specimens from 1993 and 1995 (E. De Bree pers. comm.). All Belgian *Choerades* specimens in the collections of the RBINS (Brussels) and the Université de Liège (Gembloux) were reidentified by Jonas Mortelmans and Elias De Bree in 2014, but only *C. gilva* was found.

The generic characteristics of the genus *Choerades* are described in the above section on *C. fuliginosa*. *C. ignea* mostly resembles *C. gilva*. Apart from the characteristics mentioned in Table 1 (especially colour of the mystax), DE BREE *et al.* (2014) further mention differences in colour of setae on the thorax and scutellum (*C. gilva*: black; *C. ignea*: yellow) and the first sternite (*C. gilva*: shiny; *C. ignea*: dusted). In the field *C. ignea* appears more yellowish than *gilva* due to the high amount of yellow hairs, while the red markings on the abdomen are less prominent.

Table 1. Overview of the main morphological characters of recorded *Choerades* species in Belgium and the Netherlands.

	C. fimbriata/fulva	*C. fuliginosa*	*C. marginata*	*C. gilva*	*C. ignea*
Hairs of abdominal tergites	Dense yellow adpressed hairs	Long erect white-yellowish	Sparse adpressed golden hairs	Dense red adpressed hairs	Dense red/ golden adpressed hairs
Beard	Black	Mostly pale yellow, with some black hairs below	Mostly black	Mostly black with some white	Mostly yellow with some black
Size	12-18 mm	10-15 mm	10-15 mm	15-20 mm	18-22 mm
Length of first antennal segment	1,4-2 x the second antennal segment	>3 x the second antennal segment	2,5-3,5 x the second antennal segment	<2 x the second antennal segment	<2 x the second antennal segment
Postpronotal lobe	Dusted	Almost shiny	Dusted	Dusted	Dusted

The species can often be observed together with *L. flava* and *C. gilva*. However, in comparison with *C. gilva*, *C. ignea* is more restricted to lowland Pine forests with high amounts of dead wood where they can be found along sunlit forest edges, both internal and external (e.g. transition zones to heathland, large forest tracks, clearcut areas, etc). Like *C. gilva*, *C. ignea* can often be observed sitting on the bark with their head pointing downwards. In the Netherlands, egg laying has been observed on tree trunks of *Pinus sylvestris* (DE BREE *et al*., 2014). GELLER-GRIMM (1995) describes how both sexes flew in a sort of "spiral flight" around a stem checking the present *Phaenops cyanea* (Fabricius, 1775) (Coleoptera: Buprestidae), referring to this as a specialized hunting behavior. Xylobiont Coleoptera represent an above average portion of prey items of the imagos. The reason for co-existence with *C. gilva* remains unknown.

Choerades ignea was caught at the Hoge Mierdse Heide in Landschap de Liereman, a nature reserve managed by Natuurpunt vzw near Oud-Turnhout in the Campine region (Fig. 2). More precisely, it was found sunning itself in the transition zone between a Scots pine plantation with a high amount of dead wood and a heathland-patch. This area has been restored around 2005 with EU LIFE funding (LIFE Liereman) thereby creating a high amount of sunlit forest edges.

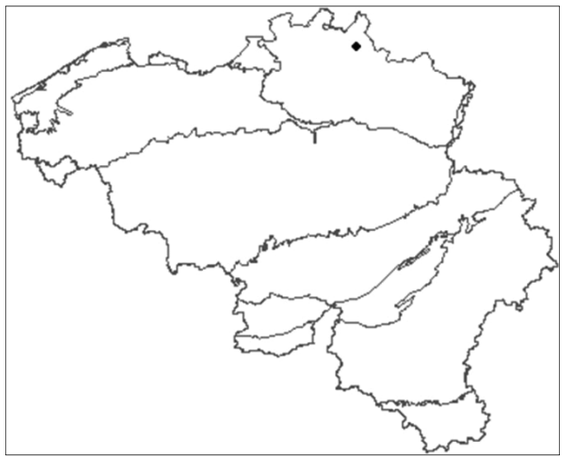

Fig. 2. Localities where *Choerades ignea* has been found in Belgium.

Choerades ignea is present in large parts of Europe and Asia. WOLFF *et al*. (2018) lists Austria, Czech Republic, Germany, Spain, France,

Hungary, Italy, the Netherlands, Poland, Romania, Sweden, Finland, Slovakia and the Russian Federation (European part, Western-Siberia).

Leptarthrus vitripennis (Meigen, 1820) new to Belgium

MATERIAL EXAMINED: Belgium, Province Luxemburg, Gros Cron de Lahage, Bellefontaine (49.635 N, 5.483 E) (prov. Luxembourg), 14.VII.2016, 1 ♀, leg. & det. J. Hendrix, J. Mortelmans, W. Tamsyn, coll. J. Mortelmans; Belgium, Province Namur, Roche à Lomme, Viroinval (50.086 N, 4.567 E), 9.VI.2018, 1 ♂, leg. det. W. Tamsyn & M. Boeraeve, coll. W. Tamsyn & M. Boeraeve.

The genus *Leptarthrus* consists of two West-Palearctic species, *L. vitripennis* (Meigen, 1820) and *L. brevirostris* (Meigen, 1804), and one East-Palearctic species, *L. krali* (Hradský & Geller-Grimm, 1997) (GELLER-GRIMM & HRADSKÝ, 1997), only known from type material in China. *Leptarthrus* was formerly included in the subfamily Dasypogoninae but recent molecular phylogenetic research showed that it is in fact part of the new subfamily Brachyrphopalinae. In Western Europe, this subfamily also includes the genera *Cyrtopogon* and *Holopogon* (DIKOW, 2009). Brachyrphopalinae is a diverse family with species with quite different size and shapes. Members of this subfamily often have a pronounced sexual dimorphism, e.g. *Holopogon nigripennis* (Meigen, 1920). They share antennae with a short arista which is mostly shorter than the postpedicel, the antennae are not placed upon a clear bump. The absence of a big thorn on a protrusion of the tibia of the forelegs separates the species from the Dasypogoninae (WOLFF *et al*., 2018).

Leptarthrus brevirostris is known from Belgium for quite some time (TOMASOVIC, 1998) from a few sites in eastern-and-southernmost Belgium (e.g. Hautes Fagnes and the Belgian Lorraine). On these sites, the species can locally be very abundant (pers. obs.). The much rarer species *L. vitripennis* was until now unknown to Belgium. It is easily distinguished from *L. brevirostris* by the very short haired scutum and lack of facial protrusion (Table 2). Also, the hind tibiae are largely yellowish-red with only a small black apex, in contrast to *L. brevirostris* which only has pale basal parts on the hind tibiae. On the hind legs, males of *L. vitripennis* exhibit a pale metatars, which is not longer than the next three segments combined compared to a black metatars, longer than the next three tarsal parts in *L. brevirostris* (HRADSKÝ & GELLER-GRIMM, 1997; VAN VEEN, 1996).

Table 2. Overview of the main morphological differences of the Western-Palearctic *Leptharthrus* species (STUBBS & DRAKE, 2014; WOLFF *et al*., 2018).

	Leptharthrus brevirostris	*Leptharthrus vitripennis*
Mystax	Black, dense	White, sparse
Face	Shiny black, with protruding facial knob	Silvery dusted without protruding facial knob
Tars 3 male	Longer than tibia 3	Shorter than tibia 3
Metatars	Black	Red with black top
Hairs on thoracic dorsum	Long on both front & hind part	Short in front, long on hind part
Scutellum	Dull	Shiny
Size	9-12 mm	6-12 mm
Wing	♂: with a darkened tip ♀: slightly yellowish at the base	Slightly infuscated at the base
Abdominal tergites	♂: No dust spots ♀: Dust spots	Both sexes with dust spots

Leptarthrus vitripennis was found at two locations (Fig. 3): one individual on top of a tufa hill covered with calcareous grassland in the Lorraine region. The other individual was found hunting from the tip of dead twigs of *Prunus spinosa,* at the edge of a calcareous grassland on top of a hill. Both locations are surrounded by extensive cover of deciduous forest. This fits into the habitat described in other parts of Europe, for example in Great Britain where it was also found on calcareous grassland. In Sweden, the species is found on grasslands surrounded by deciduous forest, and in parklands (ANDERSSON *et al*., 2008). In Germany the species is also known from species rich grasslands (WOLFF *et al*., 2018). With *L. brevirostris* occurring in similar habitat, care should be taken to avoid confusion of both species. However, no misidentified specimens of *L. vitripennis* were found in the collections of the RBINS (J. Mortelmans).

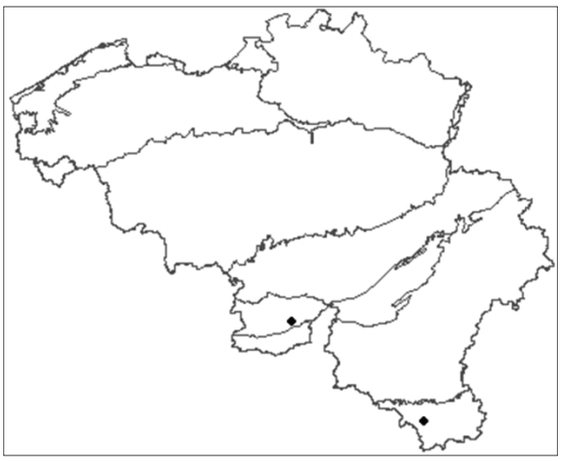

Fig. 3. Localities where *Leptharthrus vitripennis* has been found in Belgium.

The species is widespread in Europe with observations from Austria, France, Germany, Great Britain, Greece, Italy, Norway, Poland, Russia, Slovakia, Sweden and Switzerland (BYSTROWSKI *et al*., 2015; HALLGASS, 2016). Despite its large range, it is probably quite rare to very rare across its range, with very few observati6ns known. In Germany, the species is considered endangered (WOLFF, 2011). Also in Sweden *L. vitripennis* is considered endangered, with thresholds for both the limited distribution and continuing decline of the population. Possible threats mentioned include reduced grazing of pastures leading to scrub encroachment and diminished habitat quality of grasslands (ANDERSSON *et al*., 2008). However, it should be noted that the species is very poorly known; especially the ecology is virtually undescribed. The flight period probably ranges from the beginning of June to mid-July.

Discussion

The arrival of three species of Asilidae is noteworthy, especially because Asilidae are considered a well-known family of flies in North-West Europe. With relatively few efforts, these species were found. In the case of *C. ignea* a true new arrival to the country is most plausible, since the species also showed a remarkable range expansion in the Netherlands (DE BREE *et al.,* 2014). It seems indeed unlikely that this species would have been overlooked, since it is a very large and conspicuous species, occurring in areas that get a lot of attention from naturalists in general e.g. heathlands in the Campine region. In the case of *L. vitripennis* the species appears to be flying in low densities throughout its range so it is probably overlooked. The case of the recent discovery in England, where older specimens were found in the collections after its discovery in the field supports this hypothesis (HAWKINS, 1998). In the case of *C. fuliginosa* it is not quite clear whether this is an overlooked species or a recent arrival in Belgium. However, Diptera, and especially Asilidae, are relatively well studied in the region, e.g. (MORTELMANS *et al*., 2012; VAN DE MEUTTER & MORTELMANS, 2010, TOMASOVIC 1998). Still, there seems to be a lot of potential to find new species for the Belgian fauna, even in relatively well studied taxonomic groups such as Asilidae.

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