

Hoverflies at the edge: new southern records of two European genera of Syrphidae (Diptera)

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Abstract

Hoverflies at the edge: new southern records of two European genera of Syrphidae (Diptera). Records of two species of hoverflies (Diptera, Syrphidae), *Hammerschmidtia ferruginea* (Fallén, 1817) and *Megasyrphus erraticus* (Linnaeus, 1758), are here provided for the first time in the Iberian Peninsula, both records located at the southern edges of these genera ranges in Europe. The new data is reported following fieldwork in the Pyrenees of Huesca and Lleida provinces (Spain) and consultation of the 'Museu de Ciències Naturals de Barcelona' entomological collection. The importance of these findings is discussed in the frame of the conservation of these species' habitats.

Key words: *Hammerschmidtia*, *Megasyrphus*, Conservation, New records, Spain, Scientific collections

Resumen

Sírfidos en los límites: nuevos registros de dos géneros de Syrphidae (Diptera) en el sur de Europa. Se proporcionan, por primera vez en la península ibérica, los registros de dos especies de sírfidos (Diptera, Syrphidae), *Hammerschmidtia ferruginea* (Fallén, 1817) y *Megasyrphus erraticus* (Linnaeus, 1758), ambos localizados en los límites meridionales del área de distribución de estos géneros en Europa. Los nuevos datos fueron obtenidos a partir de trabajo de campo realizado en los Pirineos de las provincias de Huesca y Lleida (España), y de la revisión de la colección entomológica del Museu de Ciències Naturals de Barcelona. La importancia de estos hallazgos es discutida en el marco de la conservación de los hábitats de estas especies.

Palabras clave: *Hammerschmidtia*, *Megasyrphus*, Conservación, Nuevos registros, España, Colecciones científicas

Resum

Sírfids al límit: registres nous de dos gèneres de Syrphidae (Diptera) al sud d'Europa. Es proporcionen per primera vegada a la península Ibèrica els registres de dues espècies de sírfids (Diptera, Syrphidae), *Hammerschmidtia ferruginea* (Fallén, 1817) i *Megasyrphus erraticus* (Linnaeus, 1758), ambdós localitzats als límits meridionals de l'àrea de distribu-

ció d'aquests gèneres a Europa. Les noves dades van ser obtingudes a partir de treball de camp dut a terme als Pirineus de les províncies d'Osca i de Lleida (Espanya), i de la consulta de la col·lecció entomològica del Museu de Ciències Naturals de Barcelona. La importància d'aquestes troballes es discutida en el marc de la conservació dels hàbitats d'aquestes espècies.

Paraules clau: *Hammerschmidtia*, *Megasyrphus*, Conservació, Registres nous, Espanya, Col·leccions científiques

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Hoverflies (Diptera, Syrphidae) are one of the most important families of pollinator insects due to their adults' feeding regimes linked to flowers (Doyle et al., 2020). Over 6,300 species are known to the family (Skevington et al., 2019), of which 421 species and 72 genera are included in the most recent checklist of the Syrphidae of Spain, Andorra and Gibraltar (Ricarte and Marcos–García, 2017).

The first records of the genera *Hammerschmidtia* Schumel, 1834 (Syrphidae, Eristalinae) and *Megasyrphus* Dušek and Láska, 1967 (Syrphidae, Syrphinae) from the Iberian Peninsula and Spain are provided here as a result of a hand-net survey in the central part of the Pyrenees, in the provinces of Huesca (Aragón) and Lleida (Cataluña), and the consultation of staff from the entomological collection at the Museu de Ciències Naturals de Barcelona (MCNB hereafter). Neither genera have been cited in Portugal, according to the available hoverfly checklist (Van Eck, 2011, 2016). A male of *Hammerschmidtia ferruginea* (Fallén, 1817) (fig. 1A–1C) was collected in the beech forest of Salenques (Huesca) (42° 35' 49" N 0° 45' 27" E, 1,460 m a.s.l.; 16/06/2024; I. Ballester–Torres Leg.), feeding on flowers of *Angelica* sp. A male of *Megasyrphus erraticus* (fig. 2A–2B) was collected on the verge of a mixed forest with beech and pine in Sant Joan de Toran (Lleida) (42° 49' 11" N 0° 48' 19" E, 1,060 m a.s.l., 18/06/2024; I. Ballester–Torres Leg.), feeding on a flower field, mainly consisting of *Ranunculus* species. Both hoverfly specimens are deposited at the CEUA–CIBIO collection, University of Alicante, Spain, and bar-coded as 'CEUA00116979' and 'CEUA00116980' (*H. ferruginea* and *M. erraticus*, respectively). During a visit of Antonio Ricarte to the MCNB for revision and identification of hoverflies in its entomological collection, an unidentified specimen was found and determined to be a *M. erraticus* female. The individual was caught in Montanyó de Llacs, Aigües Tortes and Estany de Sant Maurici National Park (Lleida), in August, 1958, unknown Leg. (MZB 67–3064). All three studied specimens were identified with van Steenis et al. (2020) (*H. ferruginea*) and van Veen (2004) and Bartsch (2009) (*M. erraticus*).

Hammerschmidtia hoverflies superficially resemble dung-flies (Scatophagidae) and can be separated from other Syrphidae by the following combination of characters: medium to large body size (6–12 mm), mainly brown; eyes bare; arista plumose (pile of arista at least three times as long as basal diameter of arista), except for *Hammerschmidtia ingrlica* Stackelberg, 1952 (arista almost bare); metasternum and katopimeron bare; subscutellar hair fringe absent; wing cell r1 open, not petiolate; apical crossvein perpendicular or slightly recessive

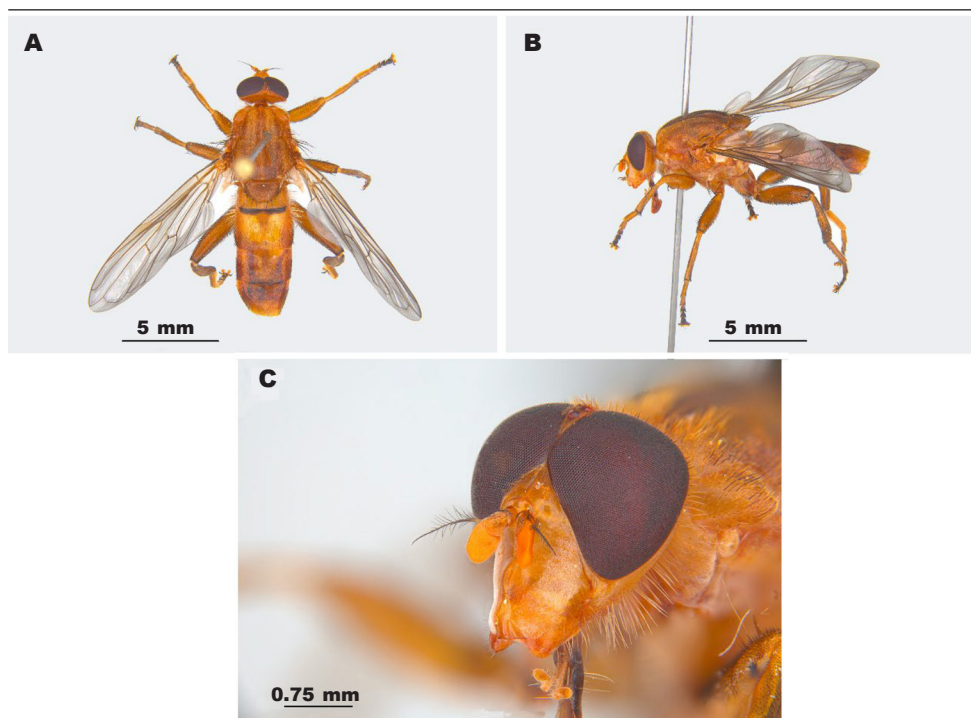


Fig. 1. *Hammerschmidtia ferruginea*, male from Huesca, Spain: A, dorsal view; B, lateral view; C, antenna, lateral view.

Fig. 1. *Hammerschmidtia ferruginea*, macho de Huesca, España: A, vista dorsal; B, vista lateral; C, antena, vista lateral.

(Thompson and Rotheray, 1998; van Steenis et al., 2020). This genus was once thought to be a subgenus of *Brachyopa* Meigen, 1822, but recent molecular studies clearly separate the two genera (Skevington et al., 2019). *Hammerschmidtia* can be distinguished from the similar *Brachyopa* by the presence of strong bristles on the anepisternum, postalar callus and scutellum; short and strong black spines on the anterior surface of the hind tibia, larger size, and more elongate shape (Thompson and Rotheray, 1998; Skevington et al., 2019). *Hammerschmidtia* is represented by only five species worldwide, two of which are known to occur in Europe: *H. ferruginea* and *H. ingrca* (Speight, 2020). Another two species are found widespread in North America (Skevington et al., 2019), while a fifth *Hammerschmidtia* species was described from China by Chu (1994). The two species can be differentiated by the following morphological traits: *H. ferruginea* has a plumose arista, while *H. ingrca* has a short-haired arista (no longer than 3 x the basal diameter of arista); *H. ferruginea* has the posteroventral part of katepisternum with long, strong and black bristles, and the apex of profemur anteriorly with 1 to 4 strong, long yellow or black bristles, while *H. ingrca* lacks these strong bristles in the previously mentioned parts (van Steenis et al., 2020).

Hammerschmidtia ferruginea is a Palearctic species found from northern Norway south to the Pyrenees, east through the Alps, Balkan Peninsula and Poland towards European Russia, also known from Scotland (Speight, 2020; van Steenis et al., 2020). It was formerly recognized to be Holarctic, but Skevington et al. (2019) showed that Nearctic populations

belong to a separate, underscribed species, according to DNA evidence (Skevington et al., 2019). Larvae of *Hammerschmidtia* are saproxylic, lasting for 2–3 years while developing in wet, decaying sap under the bark of recent dead trees and logs of *Populus tremula* L. (Rotheray et al., 2009; Speight, 2020; van Steenis et al., 2020). When fallen wood is scarce, *H. ferruginea* depends on sap flows for breeding, helping the species to survive but at reduced population levels (Rotheray et al., 2009). Due to the high microhabitat specificity of *H. ferruginea* larva, this species is particularly vulnerable to climate change and to habitat modifications (van Steenis et al., 2021). For example, the number of localities with detectable populations of *H. ferruginea* in the British Isles is known to suffer ups and downs, probably related to fluctuations in the amount of available dead wood (Rotheray et al., 2009).

In the Iberian Peninsula, *P. tremula* is a protected tree species with a northern distribution, occurring sparsely in the northern mountain ranges and points of the Iberian and Central Systems (MITECO, 2011). On the eastern part of the Posets–Maladeta Natural Park, the Salenques beech forest is a mixed forest dominated by *Fagus sylvatica* L., part of the Natural Fluvial Reserve of the river Salenques (MITECO and Confederación Hidrográfica del Ebro, 2017). According to the MITECO biodiversity viewer, *P. tremula* may occur in isolation in this locality or in forest patches close to Salenques. Due to the high habitat specificity of *H. ferruginea* larva, we hypothesize that the adult found in Salenques beech forest may come from one of these isolated patches of *P. tremula*, where this species may be developing. Otherwise, *H. ferruginea* had been reported from the French Pyrenees (van Steenis et al., 2020) and its presence in the Spanish side of the Pyrenees was expected.

We would like to stress the importance of a proper management of dead wood in the Salenques forest and vicinities, as some true saproxylic species such as *H. ferruginea* are highly dependent on the availability of this resource (Rotheray et al., 2009, 2014; van Steenis et al., 2020). Rotheray et al. (2014) insisted on the importance of the availability of enough dead wood for the development of saproxylic species, as their dispersal ability depends on population density, and their population density depends on an optimal amount of dead wood. Authors have also recommended some conservation management techniques, such as maintaining breeding habitat continuity by fulfilling gaps in dead wood, or creating new habitat by planting *P. tremula* patches every 5 kilometres, as authors determined this longitude as the optimum dispersal ability distance for *H. ferruginea*. As an example of this proper management, a pilot project in the Natural Park of 'Andía–Urbasa' was carried out in the context of adaptation planning and management in the face of climate change. One of the actions carried out under this project was to promote an increase in the availability of large dead wood pieces (mainly *Fagus sylvatica*), while preserving old trees, maintaining a mosaic of the different stages of the silvo–genetic cycle of beech forest (Gil et al., 2017). These management actions could also be carried out in *Populus* stands for the benefit of *H. ferruginea* and other saproxylic organisms, provided that the extent of the patch is sufficiently large, but also close to other patches.

The genus *Megasyrphus* comprises six species worldwide, *Megasyrphus erraticus* being the only species found in Europe (Skevington et al., 2019; Vujić et al., 2022). The genus is closely related to *Didea* Macquart, 1834 and *Eriozona* Schiner, 1860 (Wong et al., 2023), as all three were formerly treated under the same genus due to its morphological similarities (Speight, 2020). *Megasyrphus* can be distinguished from *Didea* by the black and yellow lateral margin of tergum III and IV, entirely black in *Didea* (Thompson and Rotheray, 1998; Skevington et al., 2019). *Megasyrphus* can be also separated from *Eriozona* by the presence of yellow fasciae on tergum II and III, while absent in *Eriozona*, as well as the general appearance, that in *Eriozona* is bumble–bee like, and in *Megasyrphus* is more reminiscent of a wasp (van Veen, 2004; Bartsch et al., 2009). *Megasyrphus erraticus* occurs mainly in northern and Central Europe, from Fennoscandia to the Pyrenees and from Ireland eastwards to European Russia, Siberian far east, central Asia and Japan (Barkalov and Mutin, 2019; Nedeljković and Ricarte, 2021). As for *H. ferruginea*, *M. erraticus* had also been

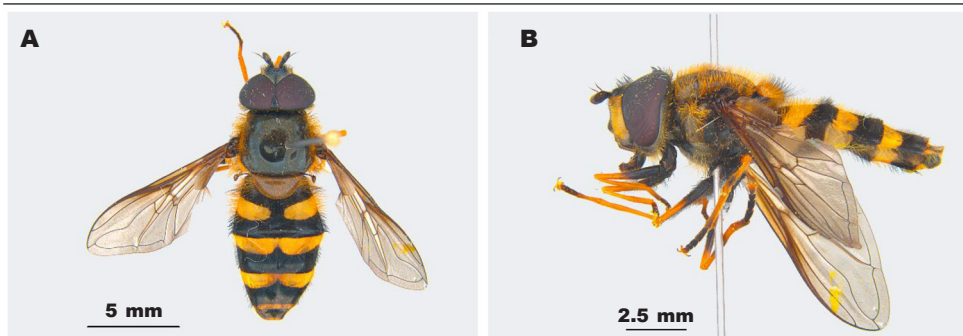


Fig. 2. *Megasyrphus erraticus*, male from Lleida, Spain: A, dorsal view; B, lateral view.

Fig. 2. *Megasyrphus erraticus*, macho de Lleida, España: A, vista dorsal; B, vista lateral.

reported from the French Pyrenees (Sarhou and Speight, 1997). Larva of *M. erraticus* has been found feeding on aphids on *Pinus* and *Picea*, also on *Hordeum* (Rojo et al., 2003; Skevington et al., 2019), and reared by Kula (1982) as overwintering among leaf litter on the floor of spruce (*Picea*) forest. The presence of *Pinus* and *Hordeum* in Sant Joan de Toran makes the presence and the breeding of the species very likely, as the habitat has the host plants of the known aphid prey required to complete its life cycle.

After the finding in the MNCB collection, we also highlight here the importance of the scientific collections as a fundamental resource in providing valuable information about the distribution and population trends of insect species. This record plus our recent field finding of the same species suggest that the species has been developing for more than half a century in the Spanish Pyrenees, even though the ecological requirements of the species, as well as the conservation status of its populations has not been assessed in this geographic context yet. The region of the 'Vall d'Aran' (Lleida, Catalunya), where *M. erraticus* was caught, has recently been recognised as a Biosphere Reserve by the UNESCO (Ministerio de Asuntos Exteriores, Unión Europea y Cooperación, 2024). The recent finding of this species, rare in southern Europe, is yet another reason to promote the conservation of biological diversity in this UNESCO Reserve, whose declaration is devoted to this and other aims.

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