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Authors: Ricarte, Antonio, Nedeljković, Zorica, and Marcos-García, Ma Ángeles

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An exploratory survey and assessment of the hoverfly diversity (Diptera: Syrphidae) from the Pyrenees of Girona, Spain

Antonio Ricarte1*, Zorica Nedeljković1,2, Mª Ángeles Marcos-García1

1 Research Institute CIBIO (Centro Iberoamericano de la Biodiversidad), Science Park, University of Alicante, Ctra. San Vicente del Raspeig s/n, E-03690 San Vicente del Raspeig (Alicante), Spain.
2 BioSense Institute-Research Institute for Information Technologies in Biosystems, University of Novi Sad, Dr Zorana Đinđića 1, Novi Sad 21000, Serbia.
* Corresponding author: ricarte24@gmail.com

Abstract: Syrphidae are pollinators, pest predators and decomposers in European ecosystems. Camprodon (Girona province, Spain) is a valley with rich vegetation and high habitat diversity in the eastern Pyrenees. However, hoverfly biodiversity in this valley was poorly known. To explore the high potential of this area for Syrphidae, a survey with hand-net was undertaken in July/August 2020 in the valley. The list of Syrphidae species from the valley increases to 88, whilst that of the Girona province now extends to 119 species. *Chrysotoxum lessonae* Giglio-Tos, 1890 is reported for the first time from the Iberian Peninsula. The specimens of *Xylota tarda* Meigen, 1822 and *Cheilosia hypena* (Becker, 1894) represent the first documented records of these species for the Iberian Peninsula and Spain, respectively; i.e. these two species were known to occur in the Iberian Peninsula and Spain but without further locality details. A total of 19 species were new to the region of Catalonia and 23 to the Girona province. *Cheilosia* Meigen, 1822 was the genus with the highest number of species recorded, as expected from the combination of mountains, diversity of forest vegetation, and presence of rivers/streams of the Camprodon valley. Faunistic results from this fieldwork are relevant to knowledge of Diptera from Catalonia, a region of Spain where this insect family is understudied.

Keywords: Flowerflies - *Cheilosia hypena* - *Chrysotoxum lessonae* - distribution - Catalonia - Camprodon valley - checklist.

INTRODUCTION

As popular pollinators and pest predators (Rojo et al., 2003; Marshall, 2012; Doyle et al., 2020), Syrphidae are often surveyed at the local scale (e.g. Sommaggio & Corazza, 2006; Sánchez-Heredia et al., 2017; Miličić et al., 2018; Lorenzo et al., 2020). Local surveys are relevant to the understanding of biodiversity in complex ecosystems and contribute to knowledge of regional species lists. Regional lists provide a framework for expert systems to assess the conservation of habitats (Speight & Castella, 2001; Monteil, 2010; Speight et al., 2020).

The massif of the Pyrenees extends east-west over 440 km, forming a natural border between France and Spain, in southwestern Europe. With 19 000 km² and a maximum altitude of 3404 m, the Pyrenees are a complex ecosystem with many mountains, U-shaped glaciated valleys, rivers, lakes and a diverse flora and fauna.

The Pyrenees can be divided into three parts, Eastern, Central, and Western. North to south, they are divided into the axial or medial Pyrenees, and the pre-Pyrenean or external mountains (Guixé & Llobet, 2016). The north slope of the Pyrenees (France, and the ‘Vall d’Aran’ in Spain) is more humid, less continental, and with typically Eurosiberian forest, whilst the south slope (Spain) has a Mediterranean influence, with less diverse and more reduced forest (Vázquez & Fernández-Prieto, 2002). In Spain, the Pyrenees are divided into five provinces, with the easternmost part in the Girona province, Catalonia (Ricarte & Marcos-García, 2017).

The studies of Diptera in Catalonia are scattered, both temporally and geographically, and Pyrenean hoverflies are not an exception. Apart from the consequences for our ecological understanding of the Pyrenees, this scattered knowledge has also prevented the popularisation of hoverflies, as shown by their absence from field guides to
the regional fauna (Guixé & Llobet, 2016). Cuni (1881) was the first to record hoverflies from the Catalanian Pyrenees. Diptera were poorly studied in Catalonia throughout the 20th century (Puigada-Villar, 2011), with only a little fieldwork undertaken in the Pyrenees to collect hoverflies (van Doesburg, 1951; Leclercq, 1971; Lucas, 1976). The 21st century brought new hoverfly records to light from the Catalanian Pyrenees, but most of these were based on specimens collected earlier, usually in the 1970s (Marcos-García et al., 2007, 2011; van Steenis & Lucas, 2011; Ricarte & Nedeljković, 2020).

Camprodon is one of the most popular valleys of the eastern Pyrenees, with diverse vegetation and habitats (Sacasas-i-Lluís, 2009). The first hoverfly records from this valley are those of the Rev. José Andreu from 1926. However, just over a dozen species were reported from this valley prior to the present sampling (Andreu, 1926; Gil Collado, 1930; Lucas, 1976; Barkalov & Ståhls, 1997; Marcos-García et al., 2007, 2011; van Steenis & Lucas, 2011; Ricarte & Nedeljković, 2020). The aim of the present study was to improve our knowledge of the hoverflies from the Girona province by undertaking an exploratory survey and faunistic assessment in its Pyrenean part (Camprodon valley) and reviewing all the available literature.

MATERIAL AND METHODS

Study area

Camprodon valley (‘Valle de Camprodon’ in Spanish) is located in the axial eastern Pyrenees. This hilly valley is in the eastern part of the Ripollès region, Girona province (abbreviated as ‘GI’ hereinafter), Spain. The climate is typical Pyrenean, humid and rainy. The Ter river, which rises at high altitudes in this valley, is also the main water course in it. All along the valley, there are some scattered small villages and there is a ski resort at about 2000 m asl. The diverse vegetation of the Camprodon valley is dominated by a mosaic of woodlands and grasslands as a result of a long history of human use. The montane and subalpine altitudinal zones are represented in the valley. Montane vegetation (700-1600 m asl) consists mainly of deciduous forest of Quercus spp. and Fagus sylvvestris L., as well as forest of red pine (Pinus sylvestris L.). The dominant species in the understory of the montane forest is the common box (Buxus sempervirens L.). Montane vegetation of riversides includes Salix, Populus and Alnus trees. Subalpine vegetation (1600-2300 m asl) is dominated by forests of black pine (Pinus ursinata Ramond ex A. DC.) that are usually more open at higher altitudes, with alpenrose (Rhododendron ferrugineum L.) in the understory. Grasslands are also typical of the subalpine zone (Sacasas-i-Lluís, 2009). The sampling sites of the present study within the Camprodon valley are detailed in Table 1. Sites belong to four different villages, Camprodon, Llanars, Setcases, and Vilallonga de Ter.

Fieldwork and hoverfly identification

Adult hoverflies were collected by Antonio Ricarte and Zorica Nedeljković using hand-nets, from 29 July to 3 August 2020. Vegetation and especially flowers (e.g. Heracleum sphondylium L., Hypericum sp., Eupatorium cannabinum L., Knautia sp., Pastinaca sp.) were inspected for hoverflies in sunny areas, and also on some hilltops (S3, S14). Specimens were kept in tubes in the freezer until defrosting in the lab for preparation. Specimens were pinned and labelled following the usual techniques (Galante & Marcos-Garcia, 2004). A bar code label was assigned to each specimen and the information databased in an Excel file. Bar code numbers were written for each specimen (as a single code) or series of specimens (as a range of codes) in the examined material. Every code starts with ‘CEUA’ plus a number of zeros and then the actual code number (e.g. CEUA00050300), but only the number is indicated in the list of examined material.

Specimens were identified to the species level by Antonio Ricarte and Zorica Nedeljković, except otherwise stated. The literature used for identification is Nielsen (1970), Violovitch (1974), Dušek & Láska (1976), Goedlind de Tiefenau (1976), Marcos-García & Láska (1983), Vuičić (1992), Vuičić & Šimić (1995-1998), Goedlind de Tiefenau (1996), Barkalov & Ståhls (1997), Verlinden (1999), Vuičić (1999), van Steenis (2000), Hippa et al. (2001), Sommaggio (2001), Clausen & Ståhls (2007), Ståhls et al. (2008), Barkalov (2009), Bartsch et al. (2009a, b), Ricarte et al. (2010), van Veen (2010), van Steenis & Lucas (2011), Nedeljković et al. (2013), Vuičić et al. (2013), Haarto & Ståhls (2014), van Steenis et al. (2016), Speight & Sardhoul (2017), Vuičić et al. (2017), Nedeljković et al. (2018), and van Steenis et al. (2020). When it was necessary to confirm the species identification, male genitalia were dissected with entomological pins. They were cleared in a hot solution of KOH for up to 5 min, immersed in acetic acid to remove excess KOH, washed in 70% alcohol, and stored in microvials containing glycerine. When specimens were dry, they were first relaxed in a humid chamber before genitalia removal. All specimens are deposited in the CEUA-CIBIO collection, University of Alicante, Spain. Hoverflies were photographed in the field by Antonio Ricarte (except where otherwise stated) with a camera Canon® PowerShot SX730 HS. A pinned specimen of Chrysotoxum Meigen, 1803 was illustrated (Fig. 1) with photos produced as stacks of individual images made with a camera (Leica DFC 450) attached to a binocular stereomicroscope (Leica M205 C). Stacks were made in Leica Application Suite X (LAS X)®, v. 3.0.4.16529.

Taxonomic and faunistic assessments

For the collected hoverflies, the faunistic novelty of each species (Appendix) was assessed on the basis
Table 1. Sampling sites in the eastern Pyrenees of Girona province (Spain) during July/August 2020 field work. The dates when each site was visited is also presented.

| Site code | Site                                         | Latitude     | Longitude    | Altitude (m) | Date/s       |
|-----------|----------------------------------------------|--------------|--------------|--------------|--------------|
| S1        | Camprodon, ‘Roureda de can Pascal’ and vicinity | 42.313253°   | 2.386996°    | 975          | 01.08.2020   |
| S2        | Llanars, L’Escón guesthouse                 | 42.321504°   | 2.343851°    | 998          | 29.07.2020   |
| S3        | Llanars, La Creueta                         | 42.324524°   | 2.339819°    | 1138         | 29.07.2020   |
| S4        | Llanars, riverside of ‘la Riera de Feitús’, near ‘Font del tir’, on flowers of *Heracleum sphondylium* | 42.329624°   | 2.346578°    | 1007         | 29.07.2020   |
| S5        | Llanars, route Llanars-Camprodon, Ter riverside | 42.317926°   | 2.350075°    | 964          | 29.07.2020   |
| S6        | Setcases, track up to the water store       | 42.381322°   | 2.301701°    | 1317         | 30.07-02.08.2020 |
| S7        | Setcases, Vallter 2000 sky centre           | 42.422851°   | 2.267581°    | 2000-2100    | 30.07.2020   |
| S8        | Setcases, Vall de Querlat, crossroads with the Espinavell track | 42.394433°   | 2.289479°    | 1460         | 30.07.2020   |
| S9        | Vilallonga de Ter, track to La Abella       | 42.328649°   | 2.311320°    | 1055         | 03.08.2020   |
| S10       | Vilallonga de Ter, Vilallonga-Setcases road, roadside vegetation | 42.354237°   | 2.292147°    | 1161         |              |
| S11       | Vilallonga de Ter, ‘Ribera de Tregurà’ riverside | 42.336798°   | 2.289106°    | 1157         | 31.07.2020   |
| S12       | Vilallonga de Ter, Ter riverside, near Vilallonga-Setcases road | 42.357085°   | 2.292184°    | 1166         | 01-02.08.2020 |
| S13       | Vilallonga de Ter, Ribera de Tregurà, on flowers of *Pastinaca* at the roadsides | 42.341194°   | 2.296101°    | 1113         | 31.07.2020   |
| S14       | Vilallonga de Ter, Tregurà de Dalt, near aerial | 42.347625°   | 2.281892°    | 1557         | 31.07.2020   |

Fig. 1. *Chrysotoxum lessonae* male, from Camprodon valley, Girona province, Spain. (A) Dorsal view. (B) Lateral view. Scale bar = 2 mm.
of Ricarte & Marcos-García (2017) plus all other subsequent faunistic references. The Iberian Peninsula is here interpreted as the unit encompassing the mainland parts of Spain and Portugal together, plus Andorra. First documented records are also indicated in order to make locality details available for those species that had imprecise records in previous literature. A full list of material examined is provided for each species by using the site codes of Table 1. Collection dates are written in the examined material lists only for the specimens caught in S6 and S12, because these sites were visited on more than one day. For the taxonomic classification of the species collected, the arrangement of subfamilies used — indicated after each species name — follows Mengual et al. (2015). Genus and species names generally follow Speight (2020).

Checklist of Girona hoverflies

The species collected in this study are also presented in the broader frame of an updated checklist of the hoverflies from Girona province. Localities and references are provided for every species in the checklist. The following localities are listed, based on both literature and the present study: L1, Arbucias; L2, Blanes; L3, Caldes de Malavella; L4, Camprodon; L5, Caralps; L6, Cerdaña; L7, Empalmes; L8, Figueras; L9, Flàssa; L10, La Bisbal; L11, La Molina; L12, Llanars; L13, Massanàs; L14, Massanet de la Selva ‘Maçanet-Massanès station’; L15, Mollo; L16, Núria; L17, Pals; L18, Puigcerdà; L19, Ribas; L20, Ribas de Freser; L21, Rosas; L22, San Cristóbal de Tosas; L23, San Juan de las Abadases; L24, San Marsal; L25, Sant Iliari de Sacalm; L26, Sarrià; L27, Setcases; L28, Sils; L29, Torroella; L30, Viladrau; L31, Vilallonga de Ter; L32, ‘Between Campodron and Setcases’; L33, 13 km south to Girona city. Locality L4 present study: L1, Arbucias; L2, Blanes; L3, Caldes de Malavella; L4, Camprodon; L5, Caralps; L6, Cerdaña; L7, Empalmes; L8, Figueras; L9, Flàssa; L10, La Bisbal; L11, La Molina; L12, Llanars; L13, Massanàs; L14, Massanet de la Selva ‘Maçanet-Massanès station’; L15, Mollo; L16, Núria; L17, Pals; L18, Puigcerdà; L19, Ribas; L20, Ribas de Freser; L21, Rosas; L22, San Cristóbal de Tosas; L23, San Juan de las Abadases; L24, San Marsal; L25, Sant Iliari de Sacalm; L26, Sarrià; L27, Setcases; L28, Sils; L29, Torroella; L30, Viladrau; L31, Vilallonga de Ter; L32, ‘Between Campodron and Setcases’; L33, 13 km south to Girona city. Locality L4 includes the sampling site S1 of the present study; L12 includes S2, S3, S4, S5; L27 includes S6, S7, S8; L31 includes S10, S11, S12, S13, S14 (Table 1).

The following references were reviewed (numbers are used in the checklist to identify each individual reference): 1, Cuni (1880); 2, Cuni (1881); 3, Cuni (1885); 4, Antiga, 1888; 5, Andreu (1926); 6, Gil Collado (1930); 7, Leclercq (1963); 8, Leclercq (1971); 9, Lucas (1974); 10, Lucas (1976); 11, Goeldlin de Tiefenau (1889); 12, Barkalov & Ståhls (1997); 13, Marcos-García et al. (2002); 14, Marcos-García et al. (2007); 15, van Eck (2010); 16, Marcos-García et al. (2011); 17, van Steenis & Lucas (2011); 18, Álvarez-Fidalgo et al., 2018; 19, van Steenis et al. (2020); 20, Ricarte & Nedeljković (2020). Marcos-García et al. (1998) is not included in the list of references because it does not provide information on the localities within provinces. Diricks (1994) also omits locality details for species but does provide maps with distribution points, so is not cited in this checklist, except for comments on the distribution of certain species.

Regarding specific references, the following questions should be noted: a) Cuni (1881) reported hoverflies from the Spanish Cerdaña, which is divided between the Lleida and Girona provinces and he did not specify where each species was collected. Since he was based on Puigcerdà (Girona) for fieldwork, we assume here that all species belong to GI. b) Gil Collado (1930) reports hoverflies from ‘Ribas’ and ‘Rivas’, one from Madrid (Rivas?) and other from GI (Ribas? i.e. Ribas de Freser? Ribas valley?), however both names are written as ‘Ribas’ in the locality index of Gil Collado (1930), and Ribas/ Rivas also appear to be inconsistently used throughout his monograph. Thus, we include Ribas in the present checklist when there were enough grounds to believe that the species was collected in the Ribas of GI.

All species are numbered and presented in alphabetical order, including the species reported in the present work (indicated as ‘present study’). Genus and species names in the checklist follow Speight (2020), which can be consulted together with Peck (1988) for authority and year of each taxon. Where species names used in the historical literature under review have been superceded, those are given after the current name and are preceded by (=).

RESULTS

New hoverfly records from the Camprodon valley

Baccha elongata (Fabricius, 1775) (Syrphinae)
Examined material: 108852; 1 male; S5. – 108851; 1 male; S6; 31.07.2020.

Ceriana conopoides (Linnaeus, 1758) (Eristalinae)
Examined material: 108188; 1 male; S6; 31.07.2020; on flowers of Heracleum sphondylium.

Cheilosia aerea Dufour, 1848 (Eristalinae)
Examined material: 108792; 1 male; S6; 31.07.2020.

Cheilosia barbata Loew, 1857 (Eristalinae)
Examined material: 108791, 108790, 108809; 3 males; 108801, 108814, 108816-108818; 5 females; S6; 30.07.2020. – 108804-108808; 5 males; 108800, 108820; 2 females; S6; 31.07.2020. – 108803; 1 male; 108813; female; 02.08.2020. – 108812, 108819; 2 females; S9. – 108811; 1 female; S10.

Cheilosia hypena Becker, 1894 (Eristalinae)
Examined material: 108320; 1 male; S6; 30.07.2020. – 108325-108328; 4 males; S6; 108321-108324; 4 females; S6; 31.07.2020; 108778, 108779; 2 males; S6; 02.08.2020. – 108310; 1 male; 108329; 1 female; S5. – 108777; 1 female; S1. – 108776 (1 female); S11.
Cheilosia illustrata (Harris, 1776) (Eristalinae)
Examined material: 108770; 1 male; 108772, 108789; 2 females; S6; 30.07.2020; on flowers of *Heracleum sphondilium*. – 108771; 1 male; S6; 02.08.2020; on flowers of *Heracleum sphondylium*.

Cheilosia laticornis Rondani, 1857 (Eristalinae)
Examined material: 108785; 1 male; 108784; 1 female; S6; 30.07.2020.

Cheilosia latifrons (Zetterstedt, 1843) (Eristalinae)
Examined material: 108810; 1 female; S6; 30.07.2020. – 108829; 1 female; S6; 02.08.2020; 108828; 1 female; S9. – 108802; 1 female; S1.

Cheilosia longula (Zetterstedt, 1838) (Eristalinae)
Examined material: 08773; 1 male; S11; det. I. Ballester.

Cheilosia proxima (Zetterstedt, 1843) (Eristalinae)
Examined material: 108788; 1 male; S3.

Cheilosia scutellata (Fallén, 1817) (Eristalinae)
Examined material: 108826; 1 male; 108824; 1 female; S5. – 108827, 1 male; S4. – 108825; 1 female; S6; 30.07.2020.

Cheilosia variabilis (Panzer, 1798) (Eristalinae)
Examined material: 108794; 1 female; S6; 30.07.2020. – 108786; 1 female; S7.

Cheilosia vernalis (Fallén, 1817) (Eristalinae)
Examined material: 108775; 1 male; S6; 30.07.2020. – 108774; 1 female; S7.

Cheilosia vicina (Zetterstedt, 1849) (Eristalinae)
Examined material: 108775; 1 male; S6; 30.07.2020. – 108774; 1 female; S7.

Cheilosia vulpina (Meigen, 1822) (Eristalinae)
Examined material: 108780; 1 male; S3. – 108798; 1 male; S5. – 108797; 1 female; S4. – 108799; 1 male; 108796; 1 female; S13. – 108783, 108782; 2 males; S6; 31.07.2020. – 108781; 1 male; 108802; 1 female; S1; 01.08.2020.

Chrysogaster solstitialis (Fallén, 1817) (Eristalinae)
Examined material: 108234; 1 male; 108269, 108268; 2 females; S3. – 108236; 1 male; 10830-108232, 108240; 4 females; S6; 30.07.2020. – 108237, 108233; 2 males; 10841-108244; 4 females; S6; 31.07.2020; 108235; 1 male; S10. – 108267; 1 female; S9.

Chrysotoxum arcuatum (Linnaeus, 1758) (Syrphinae)
= *Chrysotoxum fasciatum* (Müller, 1764)
Examined material: 108548; 1 female; S6; 31.07.2020.

Chrysotoxum bicinctum (Linnaeus, 1758) (Syrphinae)
Examined material: 108549; 1 male; S11. – 108530; 1 female; S9.

Chrysotoxum elegans Loew, 1841 (Syrphinae)
Examined material: 108546; 1 male; S4; 108547; 1 male; S6; 30.07.2020. – 108545; 1 male; S6; 31.07.2020. – 108544; 1 male; S13.

Chrysotoxum festivum (Linnaeus, 1758) (Syrphinae)
Examined material: 108295; 1 female; S9.

Chrysotoxum lessonae Giglio Tos, 1890 (Syrphinae)
(Fig. 1)
Examined material: 108296-108298; 3 males; S12.

Chrysotoxum volaticum Séguy, 1961 (Syrphinae)
Examined material: 108834; 1 female; S5. – 108833; 1 male; S1.

Dasysyrphus albostrictus (Fallén, 1817) (Syrphinae)
Examined material: 108887; 1 female; S11; 108888; 1 male; S12. – 108885; 1 male; 108886; 1 female; S9.

Episyrphus balteatus (de Geer, 1776) (Syrphinae)
Examined material: 108834; 1 female; S5. – 108833; 1 male; S1.

Eristalis sepulchralis (Linnaeus, 1758) (Eristalinae)
Examined material: 108208; 1 female; S1.

Eristalis taeniops (Wiedemann, 1818) (Eristalinae)
Examined material: 108206; 1 male; S9.

Eristalis arbustorum (Linnaeus, 1758) (Eristalinae)
Examined material: 108170; 1 male; S13.

Eristalis interrupta (Poda, 1761) (Eristalinae)
= *Eristalis nemorum* Linnaeus, 1758
Examined material: 108211; 1 female; S6; 30.07.2020; 108212; 1 male; 01.08.2020. – 108149; 1 female; S5. – 108210; 1 female; S11. – 108142; 1 female; S12.

Eristalis jugorum Egger, 1858 (Eristalinae)
Examined material: 108152; 1 female; S8. – 108167; 1 male; S6; 30.07.2020. – 108311; 1 male; S6; 02.08.2020. – 108141, 108312, 108313; 3 females; S10.

Eristalis lineata (Harris, 1776) (Eristalinae)
= *Eristalis horticola* (de Geer, 1776)
Examined material: 108133; 1 female; S6; 30.07.2020.

Eristalis pertinax (Scopoli, 1763) (Eristalinae)
(Fig. 2A)
Examined material: 108143, 108144, 108148; 3 males; 108147; 1 female; S4. – 108150, 108216, 108215; 3 males; S1. – 108169; 1 male; S10. – 108158, 108214; 2 males; S6; 30.07.2020. – 108213; 1 male; 108140; 1 female; S6; 02.08.2020.
**Eristalis similis** (Fallén, 1817) (Eristalinae)

**Examined material:** 108131; 1 male; S3. – 108145, 108146; 2 males; S4. – 108156; 1 male; 108137; 1 female; S7. – 108134, 108135, 108153, 108157, 108159; 5 males; 108136; 1 female; S6; 30.07.2020. – 108155; 1 male; S6. 31.07.2020. – 108151; 1 female; S1. – 108168; 1 male; S12. 01.08.2020. – 108543; 1 male; S14.

**Eristalis tenax** (Linnaeus, 1758) (Eristalinae)

**Examined material:** 108132, 108120; 2 males; S3; 108138; 1 male; 108154; 1 female; S7. – 108139; 1 male; S6; 30.07.2020.

**Eumerus grandis** Meigen, 1822 (Eristalinae)

**Examined material:** 108275; 1 male; S6; 30.07.2020. – 108274; 1 male; S6; 02.08.2020.

**Eumerus ornatus** Meigen, 1822 (Eristalinae)

**Examined material:** 108229; 1 male; 108222, 108223; 2 females; S12. – 108227; 1 male; 08221; 1 female; S6; 30.07.2020. – 108224-108226, 108228; 4 males; S6; 31.07.2020.

**Eupeodes corollae** (Fabricius, 1794) (Syrphinae)

**Examined material:** 108832; 1 male; S7. – 108830, 108831; 2 females; S6; 30.07.2020. – 108849; 1 female; S11. – 108848; 1 female; S9.

**Eupeodes luniger** (Meigen, 1822) (Syrphinae)

**Examined material:** 108844; 1 male; S6; 30.07.2020. – 108842, 108843; 2 males; S6; 31.07.2020. – 108841; 1 female; S11. – 108840; 1 male; S9.

**Eupeodes latifasciatus** (Macquart, 1829) (Syrphinae)

**Examined material:** 108847; 1 male; S6; 02.08.2020.

**Ferdinandea cuprea** (Scopoli, 1763) (Eristalinae)

(Fig. 2B)

**Examined material:** 108204, 108200; 2 males; 108218; 1 female; S12; 02.08.2020. – 108202; 1 female; S1; 01.08.2020; 108201; 1 male; S10. – 108219, 108217; 2 females; S9. – 108203; 1 male; S6; 02.08.2020.

**Helophilus pendulus** (Linnaeus, 1758) (Eristalinae)

**Examined material:** 108162; 1 female; S6; 31.07.2020. – 108161; 1 male; S4. – 108160, 108179; 2 males; 108178; 1 female; S5. – 108178; 1 female; S11.

**Lapposyrphus lapponicus** (Zetterstedt, 1838) (Syrphinae)

**Examined material:** 108845; 1 male; S6; 30.07.2020. – 108846; 1 male; S6; 31.07.2020.

**Leucozona glaucia** (Linnaeus, 1758) (Syrphinae)

**Examined material:** 108884; 1 female; S6; 30.07.2020; on flowers of *Heracleum sphondylium*. – 108883;

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Fig. 2. Hoverfly species from Camprodon valley, Girona, Spain. (A) *Eristalis pertinax*, male, flowers of *Eupatorium cannabinum*, Setcases. (B) *Ferdinandea cuprea*, female, flowers of *Hypericum sp.*, Vilallonga de Ter. (C) *Milesia crabroniformis*, male, Camprodon. Photos A, B by Antonio Ricarte, C by M. Carbonell.
1 female; S6; 31.07.2020; on flowers of *Heracleum sphondylium*.

*Melangyna compositarum* (Verrall, 1873) (Syrphinae)
Examined material: 108869; 1 female; S6; 31.07.2020.

*Melangyna umbellatarum* (Fabricius, 1794) (Syrphinae)
Examined material: 108850; 1 female; S10.

*Melanostoma mellinum* (Linnaeus, 1758) (Syrphinae)
Examined material: 108870; 1 male; 108873; 1 female; 108875; 1 female; 108877; 1 female; 108878; 1 female; S6; 31.07.2020.

*Melanostoma scalare* (Fabricius, 1794) (Syrphinae)
Examined material: 108866; 1 female; S7; 30.07.2020. – 108867; 1 female; S8. – 108866; 1 female; S6; 31.07.2020.

*Meliscaeva auricollis* (Meigen, 1822) (Syrphinae)
Examined material: 108863; 1 male; S2. – 108860, 108870, 108878; 3 males; 108864, 108862, 108871, 108876, 108879; 5 females; S6; 30.07.2020. – 108874; 1 female; S6; 31.07.2020. – 108875; 1 female; S6; 01.08.2020. – 108877, 108889; 2 males; S7. – 108873, 108872; 2 females; S8.

*Meliscaeva cinctella* (Zetterstedt, 1843) (Syrphinae)
Examined material: 108865; 1 female; S7. – 108864; 1 male; S6; 31.07.2020.

*Myathropa florea* (Linnaeus, 1758) (Eristalinae)
Examined material: 108165; 1 male; 108166, 108164; 2 females; S4. – 108163; 1 male; S6; 30.07.2020. – 108205; 1 male; S1.

*Orthonevra nobilis* (Fallén, 1817) (Eristalinae)
Examined material: 108263; 1 male; S6; 30.07.2020. – 108265, 108264; 2 males; S6; 30.07.2020.

*Paragus haemorrhous* Meigen, 1822 (Syrphinae)
Examined material: 108836; 1 male; S12; 02.08.2020. – 108835; 1 male; S6; 30.07.2020.

*Paragus pecchiolii* Rondani, 1857 (Syrphinae)
Examined material: 108837; 1 male; S12; 02.08.2020.

*Paragus tibialis* (Fallén, 1817) (Syrphinae)
Examined material: 108821-108823, 108838, 108839; 5 males; S3.

*Parasyrphus vittiger* (Zetterstedt, 1843) (Syrphinae)
Examined material: 108510, 108524; 2 males; 108525-108529; 5 females; S7.

*Pipiza festiva* Meigen, 1822 (Pipizinae)
Examined material: 108273; 1 male; S9.

*Pipiza noctiluca* (Linnaeus, 1758) (Pipizinae)
Examined material: 108272; 1 male; S6; 30.07.2020.

*Pipizella viduata* (Linnaeus, 1758) (Pipizinae)
Examined material: 108288; 1 male; 108287, 108285, 108284; 3 females; S6; 31.07.2020. – 108286; 1 male; S6; 30.07.2020. – 108282, 108281; 2 males; 108283, 108280, 108299; 3 females; S10.

*Platycheirus albimanus* (Fabricius, 1781) (Syrphinae)
Examined material: 108515; 1 male; S7. – 108514; 1 male; S6; 30.07.2020. – 108513; 1 male; S6; 02.08.2020. – 108511; 1 female; S13. – 108512; 1 male; S9.

*Scaeva dignota* (Rondani, 1857) (Syrphinae)
Examined material: 108882; 1 male; S9.

*Scaeva pyrastri* (Linnaeus, 1758) (Syrphinae)
Examined material: 108516; 1 female; S6; 30.07.2020. – 108518; 1 female; S14. – 108517; 1 female; S9.

*Scaeva selenitica* (Meigen, 1822) (Syrphinae)
Examined material: 108880; 1 female; S6; 02.08.2020. – 108881; 1 female; S9.

*Sericomyia bombiforme* (Fallén, 1810) (Eristalinae)
Examined material: 108172, 108171; 2 males; S6; 30.07.2020. – 108180; 1 male; 108181; 1 female; S6; 30.07.2020. – 108173; 1 male; S7. – 108174; 1 male; S6; 31.07.2020.

*Sphaerophoria scripta* (Linnaeus, 1758) (Syrphinae)
Examined material: 108854; 1 female; S2. – 108853; 1 male; S5.

*Sphegina elegans* Schummel, 1843 (Eristalinae)
Examined material: 108172, 108171; 2 males; S6; 30.07.2020. – 108180; 1 male; 108181; 1 female; S12, on flowers of *Knautia* sp.; 02.08.2020.

*Syrphus ribesii* (Linnaeus, 1758) (Syrphinae)
Examined material: 108315; 1 male; S3; 108316; 1 female; S7. – 108314; 1 female; S6; 02.08.2020.
Syrphus torvus Osten-Sacken, 1875 (Syrphinae)  
Examined material: 108302, 108301; 2 males; 108304-108306; 3 females; S7. – 108300, 108317, 108318; 3 males; 108303, 108319; 2 females; S6; 30.07.2020.

Syrphus vitripennis Meigen, 1822 (Syrphinae)  
Examined material: 108307; 1 male; S4. – 108308; 1 female; S7. – 108309; 1 female; S13.

Triglyphus primus Loew, 1840 (Pipizinae)  
Examined material: See Ricarte & Nedeljković (2020).

Volucella bombylans (Linnaeus, 1758) (Eristalinae)  
Examined material: 108177; 1 female; S3.

Volucella inanis (Linnaeus, 1758) (Eristalinae)  
Examined material: 108176; 1 male; S6; 31.07.2020. – 108187; 1 male; S6; 01.08.2020. – 108185, 108184; 2 males; S10. – 108186; 1 male; S12; 02.08.2020.

Volucella pellucens (Linnaeus, 1758) (Eristalinae)  
Examined material: 108173; 1 male; 108175; 1 female; S8; 108174; 1 female; S6; 31.07.2020. – 108182; 1 female; S12; 02.08.2020.

Volucella zonaria (Poda, 1761) (Eristalinae)  
Examined material: 108183; 1 male; S6; 01.08.2020.

Xanthandrus comtus (Harris, 1776) (Syrphinae)  
Examined material: 108858, 108859; 2 females; S6; 31.07.2020. – 108857; 1 female; S6; 02.08.2020.– 108856; 1 male; 108855; 1 female; S12; 02.08.2020.

Xanthogramma citrofasciatum (de Geer, 1776) (Syrphinae)  
Examined material: 108292; 1 female; S2; 02.08.2020. – 108294, 108293; 2 males; S9.

Xanthogramma dives (Rondani, 1857) (Syrphinae)  
Examined material: 108290; 1 male; S10. – 108291; 1 male; S9.

Xylota segnis (Linnaeus, 1758) (Eristalinae)  
Examined material: 108191, 108195; 2 males; 108194; 1 female; S6; 31.07.2020. – 108192, 108193; 2 males; S6; 02.08.2020.

Xylota sylvarum (Linnaeus, 1758) (Eristalinae)  
Examined material: 108196; 1 male; S6; 31.07.2020.

Xylota tarda Meigen, 1822 (Eristalinae)  
Examined material: 108190; 1 female; S9. – 108209; 1 male; S12; 02.08.2020.

Xylota zonaria (Poda, 1761) (Eristalinae)  
Examined material: 108183; 1 male; S6; 01.08.2020.

Taxonomic and faunistic assessment of the new hoverfly records from Camprodon valley

Excluding the records of Triglyphus primus Loew, 1840, which represented the first finding of this genus from Spain (Ricarte & Nedeljković, 2020), one (Chrysotoxum lessonae) species is new to the Iberian Peninsula, 19 are new to Catalonia, and 23 to GI. First documented records from Spain and the Iberian Peninsula are given for Cheilosia hypena and Xylota tarda, respectively, meaning that their presence in Spain and the Iberian Peninsula was previously reported in the literature, but without locality details (Appendix).

A total of 81 hoverfly species of 38 genera were identified. The two main subfamilies (Eristalinae and Syrphinae) had a similar number of genera recorded (16 and 19 respectively). Of all genera, 34 were represented by only 1-3 species, while the genus Cheilosia Meigen, 1822 had the highest number of species in the study (13 spp.), followed by Eristalis Latreille, 1804 (7 spp.) and Chrysotoxum Meigen, 1803 (6 spp.).

Taking into consideration the altitudinal zoning indicated in the study area section and Table 1, most species represented in the study were absent from the subalpine zone, where the only exclusive species was Parasyrphus vittiger. All species except P. vittiger were found in the montane zone. Twelve species were shared between the two sampled altitudinal zones (Fig. 3).

Hoverfly checklist of the Girona province (Table 2)
See the meaning of the locality and reference codes in the Material and Methods section.

| Species | Locality (reference/s) |
|---------|------------------------|
| Baccha elongata | L1 (1; 4; 6), L12, L27 (present study) |
| = Baccha obscuripennis | |
| Ceriana conopsoides | L27 (present study) |
| Ceriana vespiformis | L19 (6) |
| Cheilosia aerea | L27 (present study) |
| Cheilosia albitalis | L19, L23 (5; 6) |
| Cheilosia barbata | L27, L32 (present study) |
| Cheilosia flavipes | L5 (5; 6) |
| Cheilosia fraterna | L18, L19 (5; 6) |
| Cheilosia impressa | L19 (5; 6) |
| Cheilosia hypena | L4, L12, L27, L32 (present study) |
| Cheilosia illustrata | L27 (present study) |
| Cheilosia laticornis | L14 (15), L27 (present study) |
| Cheilosia latifrons | L4, L27, L32 (present study) |
| Cheilosia longula | L32 (present study) |
| Cheilosia mutabilis | L17 (7) |
Syrphidae from the Pyrenees of Girona

**Specie**

| Specie                | Locality (reference/s)       |
|-----------------------|------------------------------|
| Cheilosia personata   | L32 (12)                     |
| Cheilosia proxima     | L12 (present study)          |
| Cheilosia scutellata  | L7 (3; 4; 6), L12, L27 (present study) |
| Cheilosia soror       | L14 (15), L19 (5)            |
| Cheilosia variabilis  | L27 (present study)          |
| Cheilosia vernalis    | L27 (present study), L31 (5; 6), L32 (present study) |
| Cheilosia vicina      | L27 (present study)          |
| Cheilosia vulpina     | L12 (present study), L19 (5; 6), L27, L32 (present study). |
| Chrysogaster coemiteriorum = Chrysogaster chalybeata | L1 (4), L27 (5; 6) |

**Species**

| Species              | Locality (reference/s)       |
|----------------------|------------------------------|
| Chrysogaster solstitialis | L1, L6 (6), L12, L27, L32 (present study) |
| Chrysogaster solstitialis | Notes. Cuni (1880, 1881) listed C. coemiteriorum from Arbucias and Cerdaña, but Gil Collado (1930) listed instead C. solstitialis from these two localities, and C. coemiteriorum (as C. chalybeata) only from Setcases. Here, we follow Gil Collado (1930) until Cuni’s material can be studied. |
| Chrysotoxum arcuatum  | L27 (present study)          |
| Chrysotoxum bicinctum | L27 (19), L32 (present study) |
| Chrysotoxum elegans   | L12, L27, L32 (present study) |
| Chrysotoxum festivum  | L32 (present study)          |
| Chrysotoxum intermedium | L8 (8)                      |
| Chrysotoxum lessonae  | L32 (present study)          |

**Fig. 3.** Distribution of hoverfly species by altitudinal zones (subalpine and montane) from the catch in Camprodon valley, eastern Pyrenees (Spain) in July/August 2020. For each zone, an on-site picture of the representative landscape/vegetation is shown. Species shared between zones are listed on left. Species exclusive of each zone on right.
| Species                  | Locality (reference/s)                                      | Species                  | Locality (reference/s)                                      |
|--------------------------|-------------------------------------------------------------|--------------------------|-------------------------------------------------------------|
| *Chrysotoxum volaticum*  | L15, L20, L25 (19), L32 (present study)                    | *Lejogaster tarsata*     | L5 (3; 4; 6)                                                |
| *Dasysyrphus albostriatus* | L31 (5; 6), L32 (present study)                     | = *Chrysogaster splendidus* = *Chrysogaster (Lioagaster) splendidina* |
| var. confusus            |                                                             |                          |                                                             |
| *Episyrphus balteatus*   | L12 (present study), L17 (7), L21 (3), L32 (present study) | *Leucozona glaucia*     | L27 (present study), L30 (18)                              |
| = *Syrphus balteatus*    |                                                             |                          |                                                             |
| *Eristalis aeneus*       | L21 (3), L8 (8), L19, L21 (6)                            | *Melangyna compositarum* | L27 (present study)                                         |
| = *Eristalis aeneus*     |                                                             | *Melangyna umbellatarum* | L32 (present study)                                         |
| = *Eristalis (Lathyrophthal- |                                                             | *Melanostoma mellinum*   | L1 (1; 6), L3, L21 (3; 6), L6 (2; 6), L12, L27 (present study) |
| mus*) aeneus*            |                                                             | = *Melanostoma mellina*  |                                                             |
| *Eristalis aeneus*       |                                                             | *Melanostoma scalar*     | L1 (1; 6), L6 (2; 6), L12, L27 (present study)              |
| = *Eristalis (Lathyrophthal- |                                                             | = *Melanostoma gracilis*  |                                                             |
| mus*) aeneus*            |                                                             |                          |                                                             |
| *Eristalis seculphalis*  | L4 (present study), L9, L10, L29 (7)                       | *Meligranna cincta*      | L27 (present study)                                         |
| = *Eristalis seculphalis*|                                                             |                          |                                                             |
| *Eristalis taeoniops*    | L32 (present study)                                       | *Meliscaeva auricollis*  | L12, L27 (present study)                                    |
| *Eristalis arbustorum*   | L6 (2), L32 (present study), L34 (8)                       | *Meliscaeva cinctella*   | L27 (present study)                                         |
| *Eristalis lineata*      | L4 (6), L27 (present study), L31 (5; 6)                   | *Merodon avidus A sensu* | L13 (14)                                                    |
| = *Eristalis horticola*  |                                                             | Marcos-Garcia et al. (2007) |                                                             |
| *Eristalis interrupta*   | L12, L27, L32 (present study)                             | *Merodon clavipes*       | L24 (4)                                                     |
| *Eristalis jugorum*      | L27, L32 (present study)                                  | *Merodon funestus*       | L33 (14)                                                    |
| *Eristalis pertinax*     | L4, L12, L32 (present study)                              | *Merodon rufus*          | L5, L20, L27 (16)                                           |
| *Eristalis similis*      | L4, L12, L27, L32 (present study)                         | *Merodon unguicorns*     | L27 (14)                                                   |
| *Eristalis tanax*        | L1 (1), L12 (present study), L3 (3), L6 (2), L27 (present study) | *Milesia crabroniformis* (Fig. 2C) | L1 (1; 4), L4 (present study)                              |
| *Eumerus grandis*        | L27 (present study)                                       | *Myathropa florea*       | L3 (3; 6), L4 (present study), L6 (2; 6), L12 (present study), L17 (7), L27 (present study), L31 (5) |
| *Eumerus ornatus*        | L27, L32 (present study)                                  | *Myiathropa florea*      |                                                             |
| = *Eumerus bicolor*      | L24 (4; 6)                                                | *Neoascia podagrica*     | L19 (6)                                                     |
| *Eumerus sogdianus*      | L20, L32 (9)                                             | *Orthonevra nobilis*     | L27 (present study)                                         |
| *Eueodes corollae*       | L27, L32 (present study), L31 (5; 6)                      | *Paragus albidfons*      | L1 (1; 4; 6)                                               |
| = *Syrphus corollae var. |                                                             | *Paragus haemorrhous*    | L31 (5; 6), L32 (present study)                             |
| fulvifrons*              |                                                             | = *P. tibialis var. triangulifer* |                                                             |
| *Eueodes latifasciatus*  | L27 (present study)                                       | *Paragus pecchilii*       | L8 (13), L32 (present study)                                |
| *Eueodes luniger*        | L4 (6), L27, L32 (present study), L31 (5; 6)              | *Paragus strigosatus*     | Unknown.                                                   |
| = *Syrphus luniger*      | Notes. Although this species was reported from Viladrau by Andreu (1926), Gil Collado (1930) omits this record for reasons unknown to us. |
| *Ferdinandea cuprea*     | L4, L27, L32 (present study)                              | *Paragus tibialis*       | L1 (1; 6), L4 (6), L12 (present study), L21 (3; 6)         |
| *Helophilus trivittatus* | L10 (7), L19 (6)                                         | *Parasyrphus vittiger*   | L27 (present study)                                         |
| *Helophilus pendulus*    | L12, L17, L32 (present study)                             | *Pipiza festiva*         | L32 (present study)                                         |
| *Lapposyrphus lapponicus*| L27 (present study)                                       | *Pipiza noctiluca*       | L27 (present study)                                         |
| *Lejogaster metallina*   | L6 (2; 6)                                                | *Pipizella annulata*     | L16 (17)                                                   |
| = *Chrysogaster (Lioagaster) metallina* |                                                             | *Pipizella brevis*       | L16 (9; 17)                                                |
| = *Chrysogaster (Lioagaster) metallina* |                                                             | *Pipizella pennina*      | L15, L27, L32 (9; 17)                                      |
| *Lejogaster similis*     | L27 (present study)                                       | *Pipizella microapicalis* |                                                             |
| *Lejogaster tenax*       | L1 (1), L12 (present study), L3 (3), L6 (2), L27 (present study) | Notes. Marcos-Garcia et al. (1998) also reports this species from the province of Girona as a pers. com. of Levy. The record from Palafoles (Barcellona province) by van Eck (2010) is here excluded, because it was incorrectly linked to the Girona province.
| *Lejogaster similis*     | L27 (present study)                                       | *Paragus tibialis*       | L1 (1; 6), L4 (6), L12 (present study), L21 (3; 6)         |
| *Lejogaster similis*     | L27 (present study)                                       | *Parasyrphus vittiger*   | L27 (present study)                                         |
| *Milesia crabroniformis* (Fig. 2C) |                                                             | *Pipiza festiva*         | L32 (present study)                                         |
| *Neoascia podagrica*     | L19 (6)                                                   | *Pipiza noctiluca*       | L27 (present study)                                         |
| *Orhtonevra nobilis*     | L27 (present study)                                       | *Pipizella annulata*     | L16 (17)                                                   |
| *Paragus albidfons*      | L1 (1; 4; 6)                                             | *Pipizella brevis*       | L16 (9; 17)                                                |
| *Paragus haemorrhous*    | L31 (5; 6), L32 (present study)                           | *Pipizella pennina*      | L15, L27, L32 (9; 17)                                      |
| = *P. tibialis var. trianguliferus* |                                                             | *Pipizella microapicalis* |                                                             |
### Species and Locality (reference/s)

| Species                        | Locality (reference/s)                      |
|--------------------------------|---------------------------------------------|
| Pipizella viduata              | L27, L32 (present study)                    |
| Pipizella zeneggenensis        | L4, L11, L18, L22 (10), L27 (10; 17), L32 (10) |
| Platycheirus albimanus         | L27, L32 (present study)                    |
| Platycheirus ambiguus          | L3 (3; 6)                                   |
| Platycheirus fulviventris      | Unknown. Notes. Marcos-García et al. (1998) reports this species from the province of Girona as a pers. com. of Levy. |
| Platycheirus manicusat         | L16 (5; 6)                                  |
| Ripponnensia splendens         | L31 (5; 6)                                  |
| Scaeva ignota                  | L32 (present study)                         |
| Scaeva pyrastrri               | L5 (5; 6), L6 (2; 6), L27, L32 (present study), L34 (8) |
| Scaeva selenitica              | L27 (present study), L31 (5; 6), L32 (present study) |
| Sericornia bombiforme          | L27, L32 (present study)                    |
| Sphaerophoria interrupta       | L1 (1; 6), L6 (2; 4; 6)                     |
| Sphaerophoria laurae           | L5, L16 (11)                                |
| Sphaerophoria rupellii         | L17 (7), L31 (5; 6)                         |
| Sphaerophoria scripta          | L9 (7), L12 (present study), L17 (7), L21 (3), L26, L29, (7), L31(5), L34 (8) |
| Sphaerophoria taeniata         | L6 (2; 6)                                   |
| Sphegina elegans               | L32 (present study)                         |
| Spilomyia manicata             | L27 (present study)                         |
| Syrissa pipiens                | L1 (1), L6 (2), L12 (present study)         |
| Syrphus excissus               | L19 (6), L28 (5)                            |
| Syrphus ribesii                | L6 (2; 6), L12, L27 (present study)         |
| Syrphus torvus                 | L27 (present study)                         |
| Syrphus vitripennis            | L12 (present study), L27 (present study), L31 (5; 6), L32 (present study) |
| Triglyphus primus              | L27 (20)                                    |
| Volucella bombylans            | L12 (present study), S27 (5; 6)              |
| Volucella elegans              | L31 (6)                                     |

### Doubtful records

- Platycheirus europaeus: Goedlin de Tiefenau, Maibach & Speight, 1990
  Notes. Speight (2020) states that *P. europaeus* is present in Spain, without further precision. Dirickx (1994) provides a distribution map for this species with a presence dot in Catalonia, but the position of this dot is also imprecise.

- Sphegina clavata: Scopoli, 1763 & Sphegina clunipes: Fallén, 1816
  Notes. Thompson & Torp (1986) and Dirickx (1994) each provide a distribution map with a presence dot in Catalonia for these two species. The position of this dot is imprecise, but is likely to be within the province of Girona.

### DISCUSSION

As a result of this short survey in the Camprodon valley, 81 hoverfly species were identified, including *T. primus*, the discovery of which was reported by Ricarte & Nedeljković (2020). The number of known species to this valley now stands at 85, plus *Milesia crabroniformis* (Fabricius, 1775), which is known to the authors of the present paper by a photo taken in Camprodon, on 4 October 2020, by M. Carbonell (Fig. 2C). In addition,
there are also records of a species of *Merodon* Meigen, 1803 and a species of *Rhingia* Scopoli, 1763 collected in the course of this fieldwork but not included in the Results because they are still under taxonomic scrutiny (Ricarte *et al.*, in prep.). In total, 88 species are known for the Camprodon valley. The checklist of hoverflies from the Girona province expands from 73 to 119 species as a result of the new records from Camprodon valley. Girona is now one of the best-known Spanish provinces in terms of number of hoverfly species recorded (Ricarte & Marcos-García, 2017).

Leclercq (1971) provided records of 49 hoverflies collected in the Pyrenees, mainly of the Huesca province, from July/August, i.e. the same period of the year when our sampling took place. More than half (55%) of the species reported by Leclercq (1971) and all genera were shared with our 2020 list. *Cheilosia* was the genus with the highest number of species reported by Leclercq (1971). From the seven *Cheilosia* species reported by him, just one was shared with the 2020 sampling in Camprodon. On the one hand, differences in species composition might be due to the fact that many species of Leclercq (1971) were collected in early July, whilst the 2020 sampling was in late July. On the other hand, detected differences in species composition may actually respond to differences between the surveyed Pyrenean valleys and habitats of Huesca and Girona. Specifically, *Cheilosia* hoverflies are known to be sensible to changes in the woodland landscape (Popov *et al.*, 2017), in part because their larvae, according to species, feed on different plants and fungi (Rotheray, 1993).

From the 81 species reported from the Camprodon valley in 2020, eight were saproxylic, i.e. with larvae dependent on trees (*Ceriana* Rafinesque, 1815, *Ferdinandea* Rondani, 1844, *Myathropa* Rondani, 1845, *Sphegina* Sack, 1928, *Spilomyia* Meigen, 1803, and *Xylota* Meigen, 1822). The proportion of saproxylic species (11%) is unexpectedly low from the Camprodon valley, where forests form a significant element of the vegetation. Although the present study only provides a partial overview of the hoverfly biodiversity of the Camprodon valley, we suggest that land use changes due to the expansion of urban areas and the road network, as well as promotion of agricultural and tourism activities may have had an effect in the woodlands of this popular valley, with reduction of forest cover (mainly in the lower parts of the valley, and around the ski resort), and mature trees becoming scarcer and more isolated; mature trees are crucial for the development of a rich saproxylic community (Micó, 2018). Hoverflies with aquatic larvae such as *Eristalis* Latreille, 1804 (Rotheray, 1993) appear to flourish in the montane ecosystem of the valley (e.g. 7 species of *Eristalis*), where water courses are abundant and water flow is slower than at higher altitudes. In these conditions, breeding sites for *Eristalis* are abundant. However, in the subalpine zone, only *Eristalis similis* and the cosmopolitan *Eristalis tenax* were reported, possibly due to the lower availability of breeding sites in this altitudinal zone of the valley. In the subalpine zone, water courses are smaller and their water flow is faster, due to steeper slopes (pers. obs. of Antonio Ricarte). The only hoverfly species found exclusively in the subalpine was *P. vittiger* (Fig. 3), being in accordance with its preferred environment, the conifer forest, which is dominant at these altitudes (Sacasas-i-Lluis, 2009). The larva of *P. vittiger* feeds mainly on conifer aphids and this is why its presence is correlated with conifers. Nonetheless, *P. vittiger* can occasionally be found in deciduous forest (Speight, 2020).

The genus with the highest number of species found was *Cheilosia*. Hoverflies of this genus prefer mountains, forests and the proximity of rivers and streams (Vujić, 1996), just as in the Camprodon valley. The only species of *Cheilosia* found in the subalpine zone were *C. variabilis* and *C. vicina*, both already recorded from the Pyrenees of Huesca province (Leclercq, 1971; Marcos-García, 1985). The species *C. vicina* belongs to the subgenus *Nigrocheilosia* Shatalkin, 1975, which is typical of high altitudes (Vujić, 1996). *Cheilosia variabilis* is an abundant species in southern parts of its range and occurs in a wide variety of forest types (Vujić, 1996). In addition, the presence of *Cheilosia hypena* is here confirmed from the Spanish Pyrenees. Speight (2020) mentioned that this species was present in this massif but there was no published record from Spain known to us. The finding of *Cheilosia proxima* is also important from a faunistic point of view. Séguy (1961) indicated that this species was present in Catalonia, but without further precision. Apart from this, the only published records of *C. proxima* known to us are from the León and Guipúzcoa provinces (Marcos-García, 1989, 1990a, b; Kehlmaier, 2002). Records of other *Cheilosia* species such as *C. vulpina*, which were previously reported only from 4-5 provinces of Spain (Ricarte & Marcos-García, 2017), are also important to better understand the true distribution of these species in the Iberian Peninsula.

Even though the 2020 sampling was short, faunistic results were remarkable in comparison with studies using longer periods of hand-net sampling in other parts of Spain. For example, in Cabañeros National Park, 82 species were collected by hand-netting during 468 hours of sampling in 13 months (Ricarte & Marcos-García, 2008). The reasons for such a similar result after such different sampling efforts might be due to the sampling designs, which resulted from different research aims, but could also be due to an effect of the diversity of the hoverfly community in each study area. Nonetheless, the results presented here suggest that short surveys conducted by experienced collectors during periods of high insect activity may suffice in the purpose of rapidly evaluating the biodiversity interest of a poorly studied area and/or for taking quick conservation decisions in threatened ecosystems or insect groups with well known
requirements. Further fieldwork in other periods of the year are necessary to complete the inventory of species present in the biodiverse Camprodon valley.

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REFERENCES

Álvarez-Fidalgo M., Álvarez-Fidalgo P., Ricarte A., Marcos-Garcia M. A. 2018. The genus Leucozona Schiner, 1860 on the Iberian Peninsula, including the first records of Leucozona internaria (Müller, 1776) (Diptera: Syrphidae). *BV News Publicaciones Científicas* 7(98): 128-141.

Andrè J. 1926. Notas dipterológicas. Una lista de Sírfidos para contribuir al conocimiento de los dipteros de España. *Boletín de la Sociedad entomológica de España* 9(5): 98-126.

Antiga P. 1888. Contribución a la Fauna de Cataluña. Catálogo de los Dipteros observados en diferentes sitios del Principado. *Imprenta de Viuda e Hijos de J. Subirana, Barcelona*, 16 pp.

Barkalov A. 2009. A Key to Hover Flies of the Genus Cheilosia Mg. (Diptera, Syrphidae) of Kazakhstan. *Entomological Review* 89(9): 1157-1176.

Barkalov A.V., Ståhls G. 1997. Revisión del Palearctico bare-eyed and black-legged species of the genus Cheilosia Meigen (Diptera, Syrphidae). *Acta Zoologica Fennica* 208: 1-74.

Bartsch H., Binkiewicz E., Rådén A., Nasibov E. 2009a. Blomflugor: Syrphinae. Nationalnyckeln till Sveriges flora och fauna, DH 53b. Artdatabanken, SLU, Uppsala, 406 pp.

Bartsch H., Binkiewicz E., Klintbjer A., Rådén A., Nasibov E. 2009b. Blomflugor: Eristalinae & Microdontinae. Nationalnyckeln till Sveriges flora och fauna, DH 53b. Artdatabanken, SLU, Uppsala, 478 pp.

Becker T. 1894. Revision der Gattung Chelisoba Meigen. *Nova acta Academiae Caesareae Leopoldinae-Carolinae Germanicae Natura Curiosorum* 62(3): 194-521.

Claussen C., Ståhls G. 2007. A new species of Cheilosia Meigen from Thessaly/Greece, and its phylogenetic position (Diptera: Syrphidae). *Volucella* 8: 45-62.

Cuni M. 1880. Excursión entomológica y botánica a San Miguel de Fay. *Anales de la Sociedad Española Historia Natural* 9: 204-242.

Cuni M. 1881. Excursión entomológica y botánica a la Cerdaña Española (Cataluña). *Anales de la Sociedad Española de Historia Natural* 10: 367-389.

Cuni M. 1885. Excursión entomológica a varias localidades de la provincia de Gerona. *Acta de la Sociedad espanola de Historia Natural* 14: 51-73.

de Geer C. 1776. Mémoires pour servir à l’histoire des insectes. *P. Hesselberg, Stockholmn*, Vol. 6, viii + 523 pp., 30 pls.

Dirickx H.G. 1994. Atlas des Diptères syrphides de la région méditerranéenne. Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussel, 317 pp.

Doyle T., Hawkes W.L.S., Massy R., Powney G.D., Menz M.H.M., Wotton K.R. 2020. Pollination by hoverflies in the Anthropocene. *Proceedings of the Royal Society B* 287: 20205008.

Dufour L. 1848. Histoire des Mémorphomes du Cheilosia aerea. *Annales des Sciences Naturelles, Zoologie* (3) 9: 205-209.

Dülek J., Láska P. 1976. European species of Metasyrphus: key, descriptions and notes. *Acta Entomologica Bohemoslovaca* 73: 263-282.

Egger J. 1858. Dipterologische Beiträge. *Verhandlungen der Zoologisch-Botanischen Gesellschaft in Österreich* 8: 701-716.

Fabricius J.C. 1775. Systemaentomologiae, sistensissectorumclasses, ordines, genera, species, adiectissynonymis, locis, descriptionibus, observationibus. Kortii, Flensbriget Lipsiae [= Flensburg & Leipzig]. [32] + 832 pp.

Fabricius J.C. 1781. *Species insectorum. Vol. 2, C. E. Bohnii, Hamburgi et Kilonii [= Hamburg and Kiel]*, 494 pp.

Fabricius J.C. 1794. *Entomologia sistematica emendata etuaeta. C. G. Profi, Hafniae [= Copenhagen]*, Vol. 4, [6] + 472 + [5] pp.

Fallén C.F. 1810. Specim. entomolog. novam Diptera disponendi methodum exhibens, Berlingianis, Lund. 26 pp.

Fallén C.F. 1816-1817. *Syrphici Sveciae. Berlingianis, Lundiae [= Lund]*, 1-14 [08.06.1816], 15-22 [08.06.1816], 23-30 [20.05.1817], 31-42 [20.05.1817], 43-54 [21.05.1817], 55-62 [22.05.1817] pp.

Galante E., Marcos-Garcia M.A. 2004. Métodos de preparación y conservación (pp. 47-54). *In: Barrientos J.A. (ed). Curso práctico de entomología. Manuals de la Universitat Autònoma de Barcelona*, Barcelona, 947 pp.

Giglio-Tos E. 1890. Le specie europee del genere Chrysotoxum Meig. *Atti della R. Accademia delle Scienze di Torino* 26: 134-165.

Gil-Collado J. 1930. Monografía de los Sírfidos de España. *Trabajos del Museo Nacional de Ciencias Naturales (Zoología)*, 54, 376 pp.

Goeldlin de Tiefenau P. 1976. Révision du genre Paragus (Dipt., Syrphidae) de la région paléarctique occidentale. *Bulletin de la Société Entomologique Suisse* 49: 79-108.

Goeldlin de Tiefenau P. 1989. Sur plusieurs espèces de Sphaerophoria (Dipt., Syrphidae) nouvelles ou méconnues des régions paléarctique et néarctique. *Bulletin de la Société Entomologique Suisse* 62: 41-66.

Goeldlin de Tiefenau P. 1996. On several new European species of Syrphus (Diptera, Syrphidae) and key for the Palearctic species of the genus. *Bulletin de la Société Entomologique Suisse* 69: 157-171.

Goeldlin de Tiefenau P., Maibach A., Speight M.C.D. 1990. Sur quelques espèces de Platycheirus (Diptera: Syrphidae) nouvelles ou méconnues. *Dipterist’s Digest* 5: 19-43.
Syrphidae from the Pyrenees of Girona

Rotheray G.E. 1993. Colour guide to hoverfly larvae (Diptera, Syrphidae) in Britain and Europe. *Dipterists Digest* 9: 1-156.

Sacasas-i-Lluis J. 2009. El Ripollès. Territori i Paisatge. *Publicacions de l’Abadia de Montserrat: Barcelona*, 94 pp.

Sack P. 1928-1932. Die Fliegen der Paläarktischen Region, 31. *Syrphidae. Stuttgart (Schweizerbart)*, 451 pp.

Sánchez-Heredia E.M., Arriote N., Ricarte A., Marcos-García M.A. 2017. Diversidad de sírfidos (Diptera: Syrphidae) de la Estación Biológica de Torretes (Alicante, España). *Cuadernos de Biodiversidad* 52: 38-45.

Schummel T.E. 1843. Verzeichniss und Beschreibung der bis jetzt in Schlesien gefangenen Zweifüglern der Syrphen Familie. Übersicht der Arbeiten und Veränderungen der Schlesiens Gesellschaft für vaterländische Kultur im Jahre 1842: 163-170.

Scopoli J.A. 1763. *Entomologia carnivola... I. T. Trattner*, Vindobonae [= Vienna]. [36] + 420 + [1] pp.

Séguy E. 1961. Diptères Syrphides de l’Europe occidentale. *Mémoires du Museum National d’Histoire Naturelle. Nouvelle Série, A, Zoologie* 23: 248 pp.

Shatalin A.I. 1975. Taxonomic analysis of the family Syrphidae (Diptera). *II. Entomologicheskoe Obozrzenie* 54: 899-909.

Sommaaggio D. 2001. The species of the genus Chrysotoxum Meigen, 1822 (Diptera, Syrphidae) described by Giglio Tos. *Bollettino Museo Regionale di Scienze Naturali Torino* 18(1): 115-126.

Sommaaggio D., Corazza C. 2006. Contributo alla conoscenza dei Sirfidi (Diptera Syrphidae) della città di Ferrara. *Quaderni della Stazione di Ecologia, Museo Civico di Storia Naturale, cita di Ferrara* 16: 5-20.

Speight M.C.D. 2020. Species accounts of European Syrphidae, 2020. *Syrph the Net, the database of European Syrphidae (Diptera). Syrph the Net publications, Dublin* 104: 1-314.

Speight M.C.D., Castella E. 2001. An approach to interpretation of lists of insects using digitised biological information about the species. *Journal of Insect Conservation* 5: 131-139.

Speight M.C.D., Sarthou J.-P. 2017. StN keys for the identification of the European species of various genera of Syrphidae 2017/Cés StN pour la détermination des espèces européennes de plusieurs genres de Syrphidae 2017. *Syrph the Net, the database of European Syrphidae (Diptera). Syrph the Net publications, Dublin* Vol. 99, 139 pp.

Speight M.C.D., Sommaaggio D. 2010. On the presence in Switzerland of Microdon myrmicae Schönhörg et al., 2002, *Xanthogramma dives* (Rondani, 1857) and *X. stackelbergi Violovitch, 1975* (Diptera: Syrphidae). *Entomo Helvetica* 3: 139-145.

Speight M.C.D., Castella E., Sarthou J.-P. 2020. StN 2020. In: Speight M.C.D., Castella E., Sarthou J.-P., Vanappegelm C. (eds), *Syrph the Net on CD, Issue 12. Syrph the Net Publications, Dublin*.

Stähli G., Vuijč A., Milankov V., 2008. *Cheiliosia vernalis* (Diptera, Syrphidae) complex: molecular and morphological variability. *Annales Zoologici Fennici* 45: 149-159.

Thompson F.C., Torp E. 1986. Synopsis of the European species of *Sphegina Meigen* (Diptera: Syrphidae). *Fauna Entomologica scandinavica* 17: 235-268.

van Doesburg P.H. 1951. *Syrphidae of Banyuls and environs. 10me communication sur les diptères syrphides. Vie et milieu* 2(4): 481-487.

van Eck A. 2010. Poorly recorded Syrphidae (Diptera) from Boston Society of Natural History (1875-1876) 18: 135-153.

Panzer G.W.F. 1798. Favnae insectorum germanicae initia oder Deutschlands Insecten. Heft 60. *H. Felsecker, Nürnberg* 6, 24 pp.

Peck L.V. 1988. Syrphidae (pp. 11-363). *In: Soos A., Papp, L.* (eds), *Catalogue of Palaearctic Diptera. Akadémiai Kiadó, Budapest*, 8: 363 pp.

Poda von Neuhaus N. 1761. *Insecta musei Graecensis, quae in ordines, genera et species juxta Systema Naturalis Caroli Linnaei digestis. Widmanstadti, Graeci [=Graz] 127 + [xii] pp., 2 pls.

Popov S., Miličić M., Diti I., Oskar M., Sommaaggio D., Markov Z., Vuijč A. 2017. Phytophagous hoverflies (Diptera: Syrphidae) as indicators of changing landscapes. *Community Ecology* 18(3): 287-294.

Pujade-Villar J. 2011. Aproximació a la història de l’estudi entomològic-faunístic als Països Catalans i algunes reflexions sobre el present i el futur de la ciència dels hexàpodes. *Butlletí de la Institució Catalana d’Història Natural* 76: 5-46.

Rafinesque C.S. 1815. Analyse de la nature ou tableau de l’univers et des corps organisés. [*Privately printed*], Palermo. 224 pp.

Ricarte A., Marcos-García M.A. 2008. Los sírfidos (Diptera: Syrphidae) del Parque Nacional de Cabañeros (España): una herramienta para la gestión. *Boletín de la Asociación Española de Entomología 32*(1-2): 19-32.

Ricarte A., Marcos-García M.A. 2017. A checklist of the Syrphidae (Diptera) of Spain, Andorra and Gibraltar. *Zootaxa* 4216(5): 401-440. DOI: 10.11646/zootaxa.4216.5.1

Ricarte A., Nedeljković Z. 2020. *Triglyphus primus* Loew, 1840 (Diptera, Syrphidae), new to Spain. *Boletín de la Asociación Española de Entomología 44*(3-4): 567-570.

Ricarte A., Nedeljković Z., Quinto J., Marcos-García M.A. 2010. The Genus *Ferdinandea* Rondani, 1844 (Diptera, Syrphidae) in the Iberian Peninsula: First Records and New Breeding Sites. *Journal of the Entomological Research Society* 12(3): 57-69.

Rojo S., Gilbert F., Marcos-García M.A., Nieto J.M., Mier M.P. 2003. A world review of predatory hoverflies (Diptera, Syrphidae: Syrphinae) and their prey. *Alicante: Centro Iberoamericano de la Biodiversidad*, 319 pp.

Rondani C. 1844. Species Italieae Generis Callicercus ex insectis Dipteris, distinctae et descriptae; Fragmentum octavum ad inserviendum Diteropologiae Italieae. *Annales de la Société entomologique de France* (2) 2: 61-68.

Rondani C. 1845. *Species Italieae generis Chrysotoxum insectis Dipteris, observatiae et distinctae*. Fragmentum decimunad inserviendum dipterologiae Italieae. *Annales de la Société entomologique de France* (2) 3: 193-203.

Rondani C. 1857. *Dipterologiae italieae prodomus*. Vol: II. *Species italieae ordinis dipterorum in genera characteribus defnita, ordinatim collectae, methodo analitica distinctae, et novis vel minus cognitis descriptis. Pars prima. Oestридae: Syrphidae: Conopidae*. A. Stocchi, Parmae [= Parma], 264 pp.

Rondani C. 1865. *Diptera Italiae non vel minus cognita descripta vel annotata observationibus nonnullis additis*. Fasc. I. Oestridae-Syrphidae-Conopidae; Fasc. II. Muscidae. *Atti della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* 8: 127-146 [May 1865]; 193-231 [May 1865].
Spain including species new to its fauna. *Boletín de la Sociedad Entomológica Aragonesa*, 46: 299-300.

van Steenis 2000. The West-Palaearctic species of *Spilomyia* Meigen (Diptera: Syrphidae). *Bulletin de la Société Entomologique Suisse* 73: 143-168.

van Steenis J., Lucas J.A.W. 2011. Revision of the West-Palaearctic species of *Pipizella* Rondani, 1856 (Diptera, Syrphidae). *Dipterists Digest* 18: 127-180.

van Steenis J., Ricarte A., Vujić A., Birtele D., Speight M.C.D. 2016. Revision of the West-Palaearctic species of the tribe Cerioïdini (Diptera, Syrphidae). *Zootaxa* 4196 (2): 151-209.

van Steenis J., van Zuijen M.P., Ricarte A., Marcos-García M.A., Doczkal D., Ssymank A., Mengual X. 2020. First records of *Chrysotoxum volaticum* Séguy, 1961 from Europe and *Platycheirus marokkanus* Kassebeer, 1998 from Spain (Diptera: Syrphidae) together with additional records of Spanish *Chrysotoxum* Meigen, 1803. *Bonn zoological Bulletin* 69(1): 141-155.

van Veen M. 2010. Hoverflies of Northwest Europe: identification keys to the Syrphidae. *KNNV Publishing, Utrecht, Netherlands*, 247 pp.

Vázquez V.M., Fernández-Prieto J.A. 2002. El bosque Atlántico (pp. 48-69). In: Reyero J.M. (ed), *La Naturaleza de España. Ministerio de Medio Ambiente, Madrid*, 381 pp.

Verlinden L. 1999. *Cheilosia hypena* Becker, 1894 (Diptera, Syrphidae) - description of the male, re-description of the female and its separation from *Cheilosia frontalis* Loew, 1857. *Volucella* 4(1/2): 85-92.

Verrall G.H. 1873. Additions and correction to the list of British Syrphidae. *Entomologist’s Monthly Magazine* 9: 251-256.

Violovitsh N.A. 1974. A review of the Palaearctic species of the genus *Chrysotoxum* Mg. (Diptera, Syrphidae). *Entomologicheskoe obozrenie (Entomological Review)* 53: 196-217.

Vujić A. 1992. Taksonomski položaj i zoogeografska analiza roda *Cheilosia* Meigen, 1822 i srodnih rodova (Diptera: Syrphidae) na Balkanskom poluostrvu. *PhD thesis, University of Novi Sad, Serbia*, 260 pp.

Vujić A. 1996. *Genus Cheilosia* Meigen and related genera (Diptera: Syrphidae) on the Balkan Peninsula. *Monographs of Matica Srpska, Novi Sad*, 194 pp.

Vujić A. 1999. The tribe Chrysogasterini (Diptera: Syrphidae) in the Balkan Peninsula, with the description of three new cryptic species. *Studia dipterologica* 6(2): 405-423.

Vujić A., Nedeljković A., Hayat R., Demirözer O., Mengual X., Kazerani F. 2017. New data on the genus *Chrysotoxum* Meigen (Diptera: Syrphidae) from North-East Turkey, Armenia, Azerbaijan and Iran including descriptions of three new species. *Zoology in the Middle East* 63(3): 250-268.

Vujić A., Radenković S., Trifunov S., Nikolić T. 2013. Key for European species of the *Cheilosia proxima* group (Diptera, Syrphidae) with a description of a new species. *ZooKeys* 269: 33-50.

Vujić A., Stähls G., Ačanski J., Bartsch H., Bygebjerg R., Stefanović A. 2013. Systematics of *Pipizina* and taxonomy of European *Pipiza* Fallen: molecular and morphological evidence (Diptera, Syrphidae). *Zoologica Scripta* 42(3): 288-305.

Vujić A., Šimić S. 1995-1998. *Genus Eumerus* Meigen 1822 (Diptera: Syrphidae) in area of former Yugoslavia. *Glasnik Prirodnjackog Muzeja u Beogradu* B 49-50: 173-190.

Wiedemann C.R.W. 1818. Neue Insecten vom Vorgebirge der guten Hoffnung. *Zoologisches Magazin* 1(2): 40-48.

Zetterstedt J.W. 1838. *Dipterologis Scandinaviae. Sect. 3: Diptera, pp. 477-868. Insecta Lapponica, Lipsiae [= Leipzig], vi + 1, 140 pp.*

Zetterstedt J.W. 1842-1860. *Diptera Scandinaviae, Officina Lundbergiana, Lundae [= Lund.], Vol. 1, [before 06.09.1842]; vol. 2, pp. 441-894 [02.05.1843]; vol. 3, pp. 895-1012 [20.03.1844], 1013-1280 [09.04.1845]; vol. 4, pp. 1281-1738 [11.06.1845]; vol. 5, pp. 1739-2162 [03.09.1846]; vol. 6, pp. 2163-2580 [09.06.1847]; vol. 7, pp. 2581-2934 [13.09.1848]; vol. 8, pp. 2935-3366 [12.09.1849]; vol. 9, pp. 3367-3710 [1850]; vol. 10, pp. 3711-4090 [1851]; vol. 11, pp. 4091-4545 [10.03.1852]; vol. 12, pp. xx + 4547-4942 [July 1855]; vol. 13, pp. xvi+4943-6190 [01.091859 preface]; vol. 14, pp. iv + 6191-6609 [12.12.1860], pp. iii-xvi+440.
APPENDIX

First faunistic data on the hoverflies from the eastern Pyrenees of Girona province (Spain) collected in July/August 2020. (*) indicates the first documented record of a species for a geographical unit, i.e. the species was known from a geographical unit but without further locality details and this is the first time that locality details are provided. *Triglyphus primus* is omitted from this list because its records were advanced in a different publication.

| Nested geographical units in ascending order | New to | Girona | Catalonia | Spain | Iberian Pen. |
|-----------------------------------------------|--------|--------|----------|-------|--------------|
| *Chrysotoxum lessonae*                        |        |        |          |       |              |
| *Xylota tarda*                                |        |        |          |       |              |
| *Cheilosia hypena*                            |        |        |          |       |              |
| *Ceriana conopsoides*                         |        |        |          |       |              |
| *Cheilosia aerea*                             |        |        |          |       |              |
| *Cheilosia barbata*                           |        |        |          |       |              |
| *Cheilosia illustrata*                        |        |        |          |       |              |
| *Cheilosia longula*                           |        |        |          |       |              |
| *Cheilosia proxima*                           |        |        |          |       |              |
| *Cheilosia vicina*                            |        |        |          |       |              |
| *Chrysotoxum arcuatum*                        |        |        |          |       |              |
| *Chrysotoxum elegans*                         |        |        |          |       |              |
| *Eristalis similis*                            |        |        |          |       |              |
| *Eumerus grandis*                             |        |        |          |       |              |
| *Eumerus ornatus*                             |        |        |          |       |              |
| *Helophilus pendulus*                         |        |        |          |       |              |
| *Melangyna umbellatarum*                      |        |        |          |       |              |
| *Meligranna cincta*                           |        |        |          |       |              |
| *Meliscaeva cinctella*                        |        |        |          |       |              |
| *Sericomyia bombiforme*                       |        |        |          |       |              |
| *Scaeva dignota*                              |        |        |          |       |              |
| *Sphegina elegans*                            |        |        |          |       |              |
| *Cheilosia latifrons*                          |        |        |          |       |              |
| *Cheilosia variabilis*                        |        |        |          |       |              |
| Nested geographical units in ascending order |
|-----------------------------------------------|
| **New to:** | **Girona** | **Catalonia** | **Spain** | **Iberian Pen.** |
| Chrysotoxum festivum                          |           |               |           |                 |
| Eristalinus taeniops                          |           |               |           |                 |
| Eristalis interrupta                          |           |               |           |                 |
| Eristalis jugorum                            |           |               |           |                 |
| Eristalis pertinax                            |           |               |           |                 |
| Ferdinandea cuprea                           |           |               |           |                 |
| Lapposyrphus lapponicus                       |           |               |           |                 |
| Melangyna compositarum                        |           |               |           |                 |
| Meliscaeva auricollis                         |           |               |           |                 |
| Orthonevra nobilis                           |           |               |           |                 |
| Parasyrphus vittiger                          |           |               |           |                 |
| Pipiza festiva                                |           |               |           |                 |
| Pipiza noctiluca                              |           |               |           |                 |
| Pipizella viduata                             |           |               |           |                 |
| Platycheirus albimanus                        |           |               |           |                 |
| Spilomyia manicata                            |           |               |           |                 |
| Syrphus torvus                                |           |               |           |                 |
| Volucella pellucens                           |           |               |           |                 |
| Xanthandrus comtus                            |           |               |           |                 |
| Xylota segnis                                 |           |               |           |                 |
| Xylota sylvarum                               |           |               |           |                 |