New faunistic records and host-parasite interactions of louse flies (Diptera: Hippoboscidae) from a community of birds collected by mist-netting in the Spanish Central System

Mikel A. González1,* , Juan Carlos Hidalgo2, Carlos Talabante3 & Iván Bernal4

1 Departamento de Ecología de Humedales, Estación Biológica de Doñana (EBD-CSIC), 41092 Sevilla, España.
2,3 Grupo de anillamiento Álula, Madrid. 28410. España.
*Corresponding author: mikel_alexander86@hotmail.com – https://orcid.org/0000-0002-5754-862X
2 legardon@gmail.com – https://orcid.org/0000-0002-2768-6239
3 carlos_talabante_ramirez@yahoo.es – https://orcid.org/0000-0002-7544-340X
4 bernalsosa.ivan@gmail.com – https://orcid.org/0000-0002-8432-9041

ABSTRACT

Louse flies and keds (Diptera: Hippoboscidae) are permanent ectoparasites of birds and mammals, respectively. The abundance and species composition of the Spanish Hippoboscidae fauna is relatively little studied, with 20 species recorded so far. The aim of this pilot study is to provide new data on these ectoparasites from birds collected by mist-netting in two ringing stations in the Central System mountains in Madrid (Spain). Four polyxenous louse fly species, all of the subfamily Ornithomyinae, were obtained and identified from 13 avian hosts (Order: Passeriformes). They are, in decreasing order of abundance: Ornithomya fringillina (Curtis, 1936), Ornithophila metallica (Schiner, 1864), Ornithomya avicularia (Linnaeus, 1758), and Ornithoica turdi (Oliver in Latreille, 1811). The woodchat shrike Lanius senator Linnaeus, 1758 was the most common avian species parasitized by hippoboscids. New faunistic records and host-parasite interactions are provided for the first time in Spain.

Keywords. Diptera, Hippoboscidae, Spain, avian hosts, diversity.

RESUMEN

Nuevos datos faunísticos e interacciones de moscas piojo (Diptera: Hippoboscidae) parasitando aves capturadas con redes japonesas en el Sistema Central (España)

Las moscas piojo (Diptera: Hippoboscidae) son ectoparásitos permanentes de aves y mamíferos. La abundancia y composición faunística de los hipoboscidos de España está relativamente poco estudiada, con 20 especies registradas hasta el momento. El objetivo de este estudio es aportar datos nuevos sobre estos ectoparásitos a partir de hospedadores aviares recogidos con redes japonesas en dos estaciones de anillamiento del Sistema Central en Madrid (España). Se identificaron cuatro especies generalistas de moscas piojo de la subfamilia Ornithomyinae, obtenidas de 13 hospedadores aviares (Orden: Passeriformes). Estas especies son, en orden de abundancia decreciente: Ornithomya fringillina (Curtis, 1936), Ornithophila metallica (Schiner, 1864), Ornithomya avicularia (Linnaeus, 1758) y Ornithoica turdi (Oliver in Latreille, 1811). El alcaudón común Lanius senator Linnaeus, 1758 fue la especie de ave más comúnmente parasitada por hipoboscidos. Se proporcionan nuevos datos faunísticos e interacciones aves-parásito para España.

Palabras clave. Diptera, Hippoboscidae, España, hospedadores aviares, diversidad.
Hippoboscids, also known as louse flies, flat flies or keds, are obligate ectoparasitic flies found on birds and mammals, with both sexes feeding strictly on blood; some species have occasionally been registered attacking humans (Hutson, 1984; Santolíková et al., 2022). Flies of the family Hippoboscidae have been long overlooked by the scientific community, with few studies about their species composition and ecology. In addition to the physical damage caused by their bites, they are also vectors of several infectious agents, such as protozoa, bacteria, helminths, and possibly also viruses in animals, including humans (Bezerra-Santos & Otranto, 2020). There is accumulating evidence that these ectoparasites have major effects on many aspects of host behaviour and ecology, although some studies showed no such effects. Their host specificity varies widely, ranging from high to low, depending on hippoboscid species (Veiga et al., 2019; Leikinonen et al., 2021; Santolíková et al., 2022).

Around 31 hippoboscid species have been described in Europe and up to 20 species (distributed in 11 genera and three subfamilies) have been recorded from the Iberian Peninsula and the Balearic and Canary islands (Sánchez & Carles-Tolrá, 2007; Oboňa et al., 2019a, 2022). The Spanish fauna of Hippoboscidae includes 15 species parasitizing mostly birds and 5 that feed primarily on mammals. The best-known species in Spain are the forest fly Hippobosca equina Linnaeus, 1758, a ked that feeds on horses and other large mammals, and among avian-feeding species, Stenepteryx hirundinis (Linnaeus, 1758) and Pseudolynchia canariensis (Macquart in Webb & Berthelot, 1839), that are most likely the two most prevalent species parasitizing swifts and pigeons, respectively (González, 2022). However, very scarce information is available from other avian hosts.

Bird ringing stations provide an excellent opportunity to study the fauna of Hippoboscidae parasitizing bird species. In fact, most data on the fauna of louse flies comes from bird-ringing surveys. In this pilot study, we recorded data on louse flies from avian hosts in one of the main mountain ranges in the Iberian Peninsula.

The study was carried out between the summer and autumn seasons of 2021 and 2022 at two ringing stations located in the Central System mountains in Madrid, Spain (Collado Cerrado, Canencia: 40°52′ N, 03°45′ W, and Arroyo de la Laguna, Somosierra: 41°09′ N, 03°36′ W, and 1.480 and 1.530 m a.s.l., respectively). Birds were captured using mist nets and were placed individually in cotton bags to avoid mixing ectoparasites among birds. Louse flies were collected by hand from birds and stored in capped tubes containing 70% ethanol for further identification in the laboratory. Not all louse flies could be collected, as is common in similar studies (Oboňa et al., 2019b). Louse fly specimens were identified to species level under a stereomicroscope following updated identification keys recently published for European Hippoboscidae (Oboňa et al., 2022).

**MATERIAL EXAMINED.** New host-parasite interactions for Spain are denoted with an asterisk (*).

**Ornithoica turdi** (Olivier in Latreille, 1811).

1 ♂ ex European robin Erithacus rubecula (Linnaeus, 1758), 05.09.2021; 1 ♀ ex Melodious warbler Hippolais polyglotta (Vieillot, 1817)*, 27.08.2022; 1 ♀ ex Red-backed shrike Lanius collurio Linnaeus, 1758*, 30.07.2022.

**Ornithomya avicularia** (Linnaeus, 1758)

1 ♀ ex Whitethroat Curruca communis (Latham, 1787)*, 16.07.2022; 1 ♂ ex Barn swallow Hirundo rustica Linnaeus, 1758, 12.08.2021; 2 ♀♀ ex Blackbird Turdus merula Linnaeus, 1758, 28.06.2022.

**Ornithomya fringillina** (Curtis, 1836)


**Ornithomyia** sp. (specimen damaged)

1 ♀ Blackbird Turdus merula 26.06.2021.

**Oxinthophilida metallica** (Schiner, 1864)


In total, four louse fly species, all of the subfamily Ornithomyiinae, were identified (Ornithomyia fringillina, n = 11; Ornithophilida metallica, n = 6; Ornithomyia avicularia, n = 4; and Ornithoica turdi, n = 3) (Fig. 1). They were parasitizing 13 avian host species between June and September, with higher collection numbers in July. The most parasitized avian species was the Woodchat shrike - Lanius senator (n = 5), followed by Dunock- Prunella modularis (n = 4), Blackbird (n = 4), Melodious warbler- Hippolais polyglotta (n = 2) and the remaining nine hosts (n = 1).

**Ornithomyia fringillina** and **O. metallica** were parasitized by five species each and **O. turdi** and **O. avicularia** by three each. **Oxinthophilida metallica** parasitized mostly sedentary or short distance facultative migrant bird species, except Curruca hortensis that winters in equatorial Africa, while the other parasitized species are long or short distance migrants, except T. merula, E. cia and S. rubicula, with a more sedentary character in the study area.
The four louse flies collected are considered polyxenous species attacking multiple bird species (Droz & Haenni, 2011; Nartshuk & Matyukhin, 2019; Lehikoinen et al., 2021). *Ornithomyia avicularia*, *O. fringillina* and *O. metallica* are common louse fly species reported across many European countries (Oboňa et al., 2019a). These species have been classified as broad host range species preferring several avian hosts, although a notable pattern in their host preference, which was influenced not only by the host size but also by the habitat and host breeding strategy, has been recently attributed to *O. avicularia* and *O. fringillina* (Lehikoinen et al., 2021). It is also interesting to note that the occurrence of the previous two species varies depending on the migratory status (Santolíková et al., 2022). Despite the low numbers collected in the present study, our data agree with previous studies showing that *O. fringillina* is more common in long-distance migrants, whereas *O. metallica* seems to be harbored mostly by sedentary bird species. On the contrary, our study corroborates that the presence of *O. turdi* is restricted to Southern Europe regions (Oboňa et al., 2019a), as they are widely distributed in Africa, but the number of records of this species is also increasing in Central Europe during the last years (Droz & Haenni, 2011).

The Spanish fauna of Hippoboscidae and their hosts was last reviewed by Cordero del Campillo et al. (1994), and since then very few studies have been published (e.g., Carles-Tolrá, 1998, 2001); therefore, most records in our study represent new host-parasite interactions of the four louse fly species recorded in the country. The study of louse flies should be promoted in southern Europe, where there is a limited understanding of their distribution, bio-ecology and role as potential vectors of infectious diseases.

**References**


