

An updated checklist of the Anthomyiidae (Diptera) of mainland Portugal, with 52 new species to the country

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Abstract: The family Anthomyiidae (Diptera) has received very little attention in Portugal and as a consequence the state of knowledge of this group of flies in the country is very insufficient. Until now, only 20 species were known for mainland Portugal, but non-systematic sampling carried out over more than 10 years allowed the discovery of 52 new species for the country, 12 of which are also new to the fauna of the Iberian Peninsula, and three additional species new to mainland Portugal (that had already been reported to the archipelagos of the Azores and Madeira). An updated checklist of the species that are currently known in mainland Portugal is also provided.

Key words: root maggot flies, faunal list, faunistics, Europe, new records.

Introduction

Anthomyiidae, commonly known as root maggot flies, are a relatively diverse family of calyptrate Diptera with about 1,900 species known worldwide (Marshall, 2012), in the majority of these known from the Holarctic region. The European fauna is represented by approximately 480 species placed in around 35 genera (Oosterbroek, 2006). Adults are of variable size, often black or grey in colour, sometimes yellowish or with a well-marked pattern on the thorax and abdomen. The larvae are mainly phytophagous or saprophagous, developing in different parts of decayed or living plants. Some species develop as parasitoids or cleptoparasites of other insects. A few of the phytophagous species are economically important as they attack agricultural, horticultural and forestry crops (Oosterbroek, 2006; Suwa & Darvas, 1998) (Fig. 1).

Although the group is relatively well studied in northern and central Europe, the southern European fauna has received less attention. This is certainly the case for the Iberian Peninsula, and in particular for Portugal: at the time of the publication of the checklist of the Iberian fauna by Michelsen & Báez (2002) only 17 species had been listed for mainland Portugal. Since then, *Fucellia maritima* (Haliday, 1838) and *Pegomya ulmaria* (Rondani, 1866) have been recorded by Lourenço *et al.* (2020) and Farinha *et al.* (2014) respectively, while a third species, *Anthomyia quinquemaculata* Macquart, 1839, is listed for mainland Portugal in Michelsen (2013), but without a detailed description of the record.

Since 2009, as a way of improving knowledge of this group of flies, surveys have been carried out all over mainland Portugal in different habitats that have resulted in the detection of several species not yet known from this country, thus allowing a clearer picture of its Anthomyiidae fauna.

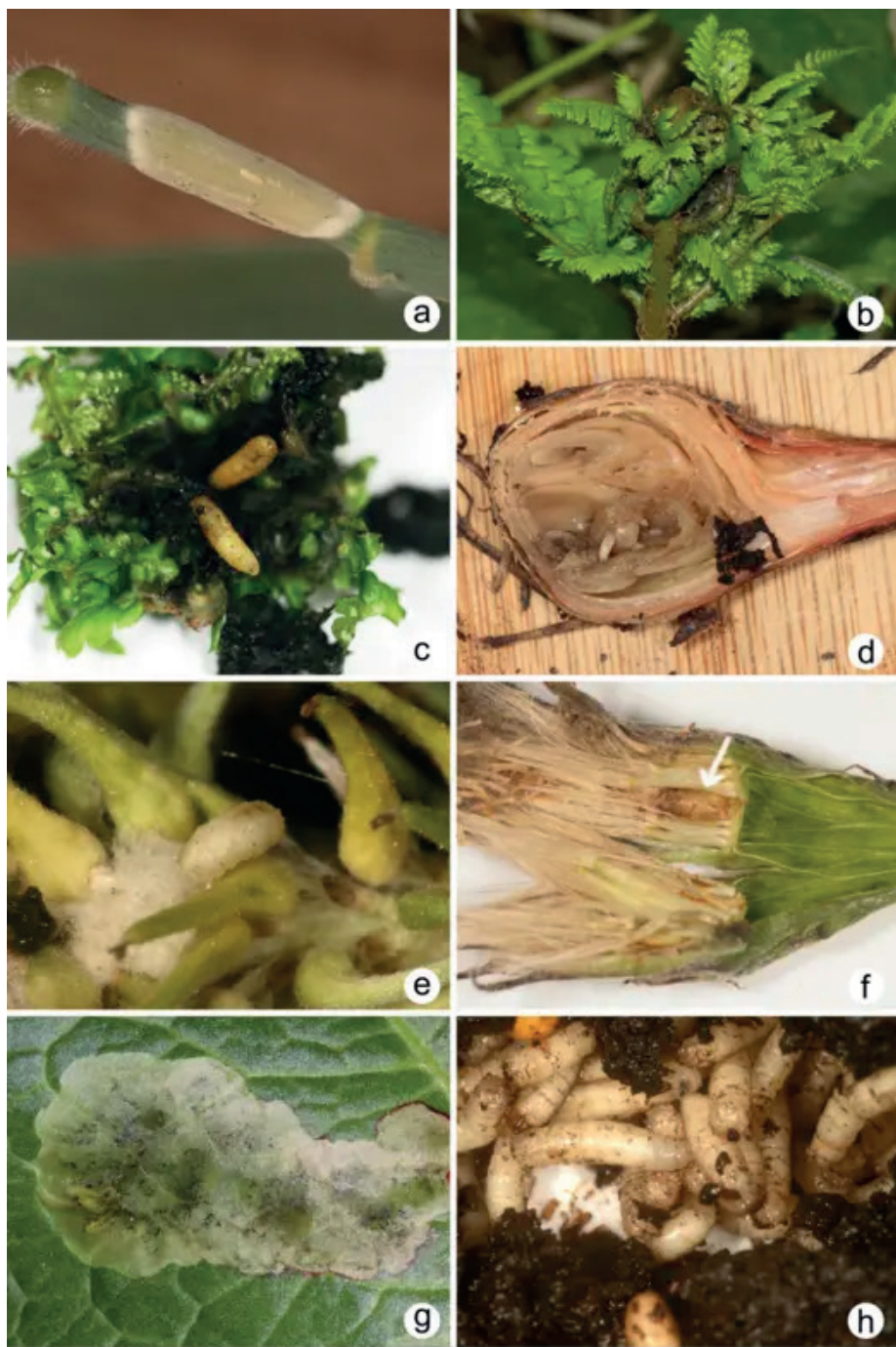


Fig. 1: Immature stages of anthomyiids: a) *Botanophila* egg on grass-infecting fungi of the genus *Epichloë*; b) Gall of *Chirosia betuleti* in *Dryopteris dilatata*; c) *Chirosia betuleti* larvae in the opened gall in *Dryopteris dilatata*; d) *Delia antiqua* larvae in a bulb of *Allium cepa*; e) *Egle* larva on a *Salix* catkin; f) *Heterostylodes* larva (white arrow) in the capitulum of *Pilosella aurantiaca*; g) *Pegomya bicolor* larvae in *Rumex* sp.; h) *Pegomya winthemi* larvae on fungi.

Material and methods

For more than 10 years now, mainly from 2009 to 2021 (but also including a few records from 2023), two of the authors (RA, AG) have carried out regular, non-systematic collecting at all times of the year across most of mainland Portugal (Fig. 2), using mostly hand-held sweep-nets (SW) complemented by yellow pan traps (YPT), a Malaise trap (MT) and occasionally hand-collecting (HC). The material was stored in 70% ethanol and later forwarded to JvE for identification.



Fig. 2: Map of mainland Portugal (shaded grey) with the sampling locations of the records included in this work.

Some adult specimens were photographed in the field and subsequently collected for identification, while others were collected and later photographed in captivity. During the fieldwork, the habitats were also photographed, with some of these photographs being made available here (Fig. 3). These photographs of living specimens and habitats were taken by the first author (RA) with cameras Fujifilm FinePix S5500, Fujifilm FinePix HS10 HS11 and Canon PowerShot SX540 HS, with a Raynox DCR-250 macro lens also being used to photograph the flies.

The photographs of the immature stages were taken by the second author (JvE) and are not material collected in Portugal, however they represent genera or species also present in this country. The material was collected in the field and later photographed using a Canon EOS 80D camera, with a Sigma 105mm macro lens.

In most cases, the male's abdomen was separated from the rest of the body while still in alcohol, and the genitalia were removed and directly prepared, as the alcohol left the material soft, and most of the soft tissue around the genitalia had already dissolved in the alcohol.

In the few cases where it was necessary to dry the specimens to aid identification, the abdomen was stored for 4-8 hours or sometimes several days in a small tube containing water with a small amount of soap to soften the genitalia, and then rinsed in water with vinegar to remove the soap residue, and finally put in 70% ethanol for about 1 hour. A drop of glycerine was then placed in the cavity of the object glass, in which the terminalia were then placed.

Sometimes the soft tissue around the genitalia had to be removed more aggressively using liquid detergent or KOH. In some cases, with larger specimens, the genitalia could be separated from the abdomen without having to completely remove it. Since the identification of species is mostly based on male genitalia, the examination of the female ovipositor was not performed.

The genitalia were then photographed with the Canon Eos 60 D, which was placed on top of the Byomic 502 trinocular microscope. With the help of the computer program Helicon Focus 6, the captured photos were merged, so that the correct depth of field was achieved. Unevenness in the photos was later updated on a Wacom cintiq 22 HD touch. These photos were used when asking for external confirmation of species identification (M. Ackland and V. Michelsen, personal communication).

All specimens were identified with the keys of Ackland (1997), Hennig (1966-1976) and other sources given in the references, and are stored in the collection of the second author (JvE), unless otherwise stated. The terminalia are stored in a genital tube filled with glycerine, together with the corresponding fly on a micropin on foam.

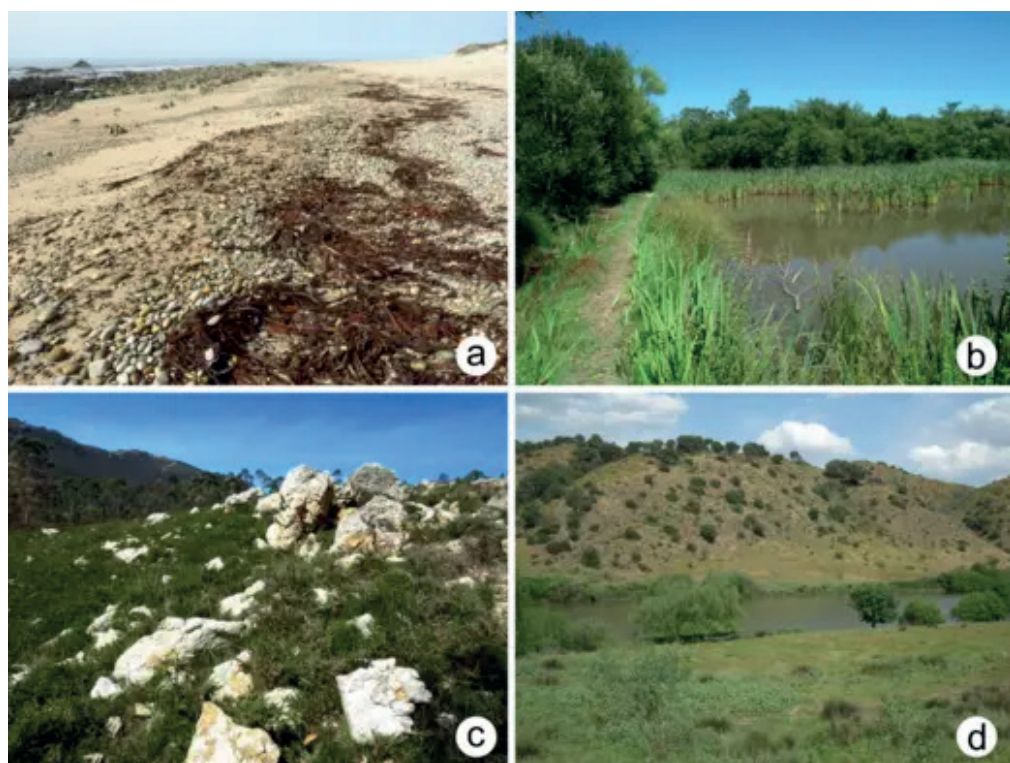


Fig. 3: Habitats of anthomyiids: a) Beach with stranded seaweed in Apúlia e Fão, habitat of *Fucellia maritima* (Haliday) and *F. tergina* (Zetterstedt); b) Brackish wetland in Canelas e Fermelã, habitat of *Eustalomyia hilaris* (Fallén), *Hydrophoria ruralis* (Meigen), *Zaphne divisa* (Meigen) and *Z. inuncta* (Zetterstedt); c) Heathland in Valongo, habitat of *Anthomyia monilis* (Meigen) and *Leucophora subsponsa* Michelsen; d) Mediterranean shrubland crossed by the Guadiana River in Mértola, habitat of *Anthomyia confusanea* Michelsen.

Localities

[PT.AV-01]	Aveiro, Estarreja, Canelas e Fermelã, 40°42'49.6"N, 8°35'09.3"W, 1m a.s.l.
[PT.AV-02]	Aveiro, Estarreja, Canelas e Fermelã, 40°43'22.7"N, 8°34'20.6"W, 4m a.s.l.
[PT.AV-03]	Aveiro, Estarreja, Salreu, 40°44'04.4"N, 8°34'51.9"W, 5m a.s.l.
[PT.BE-01]	Beja, Barrancos, Barrancos (Noudar), 38°09'46.8"N, 7°03'08.7"W, 165m a.s.l.
[PT.BE-02]	Beja, Beja, Albernoa e Trindade, 37°50'22.7"N, 7°51'27.6"W, 130m a.s.l.

[PT.BE-03]	Beja, Mértola, Alcaria Ruiva, 37°40'23.3"N, 7°50'53.9"W, 147m a.s.l.
[PT.BE-04]	Beja, Mértola, Alcaria Ruiva (Parque Natural do Vale do Guadiana), 37°44'11.7"N, 7°49'17.9"W, 194m a.s.l.
[PT.BE-05]	Beja, Mértola, Mértola (Parque Natural do Vale do Guadiana), 37°37'29.2"N, 7°39'50.3"W, 4m a.s.l.
[PT.BE-06]	Beja, Mértola, Mértola (Parque Natural do Vale do Guadiana), 37°38'30.9"N, 7°40'48.9"W, 35m a.s.l.
[PT.BE-07]	Beja, Mértola, Mértola (Parque Natural do Vale do Guadiana), 37°38'13.0"N, 7°39'47.1"W, 17m a.s.l.
[PT.BE-08]	Beja, Mértola, Mértola (Pulo do Lobo, Parque Natural do Vale do Guadiana), 37°48'54.7"N, 7°38'59.0"W, 50–150m a.s.l.
[PT.BE-09]	Beja, Mértola, São Miguel do Pinheiro, São Pedro de Solis e São Sebastião dos Carros, 37°30'08.0"N, 7°41'20.7"W, 98m a.s.l.
[PT.BE-10]	Beja, Moura, Safara e Santo Aleixo da Restauração, 38°04'40.1"N, 7°14'21.3"W, 207m a.s.l.
[PT.BE-11]	Beja, Serpa, Serpa (Salvador e Santa Maria), 37°58'46.5"N, 7°38'53.4"W, 73m a.s.l.
[PT.BE-12]	Beja, Serpa, Vila Verde de Ficalho, 37°57'46.5"N, 7°17'58.5"W, 280m a.s.l.
[PT.BR-01]	Braga, Barcelos, Barcelinhos, 41°31'36.0"N, 8°37'37.5"W, 10m a.s.l.
[PT.BR-02]	Braga, Barcelos, Gilmonde, 41°30'43.0"N, 8°38'57.0"W, 25–50m a.s.l.
[PT.BR-03]	Braga, Barcelos, Gilmonde, 41°30'42.0"N, 8°38'56.1"W, 50m a.s.l.
[PT.BR-04]	Braga, Celorico de Basto, Veade, Gagos e Molaes, 41°25'07.5"N, 7°58'54.0"W, 175m a.s.l.
[PT.BR-05]	Braga, Esposende, Apúlia e Fão (Parque Natural do Litoral Norte), 41°31'39.4"N, 8°47'28.6"W, 0–15m a.s.l.
[PT.BR-06]	Braga, Esposende, Apúlia e Fão (Parque Natural do Litoral Norte), 41°28'24.0"N, 8°46'26.6"W, 1m a.s.l.
[PT.BR-07]	Braga, Esposende, Apúlia e Fão (Parque Natural do Litoral Norte), 41°28'16.4"N, 8°46'27.2"W, 2m a.s.l.
[PT.BR-08]	Braga, Esposende, Fonte Boa e Rio Tinto (Marachão), 41°30'16.9"N, 8°43'10.6"W, 23m a.s.l.
[PT.BR-09]	Braga, Fafe, Travassós, 41°30'06.4"N, 8°10'55.6"W, 386m a.s.l.
[PT.BR-10]	Braga, Vila Nova de Famalicão, Mouquim, 41°26'01.71"N, 8°31'32.71"W, 105m a.s.l.
[PT.BR-11]	Braga, Vila Nova de Famalicão, Novais, 41°23'26.34"N, 8°26'06.06"W, 150m a.s.l.
[PT.BA-01]	Bragança, Alfândega da Fé, Alfândega da Fé, 41°20'38.8"N, 6°55'12.0"W, 251m a.s.l.
[PT.BA-02]	Bragança, Alfândega da Fé, Alfândega da Fé, 41°20'14.1"N, 6°56'50.4"W, 498m a.s.l.
[PT.BA-03]	Bragança, Alfândega da Fé, Sambade, 41°25'18.5"N, 7°00'10.4"W, 986m a.s.l.
[PT.BA-04]	Bragança, Bragança, Castrelos e Carrzedo, 41°45'15.9"N, 6°52'00.2"W, 1081m a.s.l.
[PT.BA-05]	Bragança, Bragança, Castrelos e Carrzedo, 41°45'51.7"N, 6°54'06.2"W, 917m a.s.l.
[PT.BA-06]	Bragança, Bragança, Castrelos e Carrzedo, 41°45'56.9"N, 6°54'43.5"W, 980m a.s.l.
[PT.BA-07]	Bragança, Bragança, Espinhosela (Parque Natural de Montesinho), 41°53'08.2"N, 6°49'37.4"W, 793m a.s.l.
[PT.BA-08]	Bragança, Bragança, França (Lama Grande, Parque Natural de Montesinho), 41°58'43.1"N, 6°47'38.4"W, 1357m a.s.l.
[PT.BA-09]	Bragança, Bragança, França (Parque Natural de Montesinho), 41°54'32.5"N, 6°45'26.0"W, 721m a.s.l.
[PT.BA-10]	Bragança, Bragança, França (Parque Natural de Montesinho), 41°56'33.1"N, 6°45'51.0"W, 1049m a.s.l.
[PT.BA-11]	Bragança, Bragança, Izeda, Calvelhe e Paradinha Nova, 41°33'33.4"N, 6°40'31.4"W, 318m a.s.l.
[PT.BA-12]	Bragança, Bragança, Rabal (Parque Natural de Montesinho), 41°52'50.7"N, 6°44'29.6"W, 620m a.s.l.
[PT.BA-13]	Bragança, Bragança, Rabal (Parque Natural de Montesinho), 41°52'30.3"N, 6°44'44.2"W, 616m a.s.l.
[PT.BA-14]	Bragança, Bragança, Rio Frio e Milhão, 41°43'37.3"N, 6°35'28.7"W, 619m a.s.l.
[PT.BA-15]	Bragança, Bragança, Rio Frio e Milhão, 41°47'09.5"N, 6°37'50.8"W, 710m a.s.l.
[PT.BA-16]	Bragança, Bragança, Sé, Santa Maria e Meixedo (Parque Natural de Montesinho), 41°50'45.1"N, 6°46'07.7"W, 688m a.s.l.
[PT.BA-17]	Bragança, Carrazeda de Ansiães, Fonte Longa, 41°14'16.2"N, 7°14'57.6"W, 775m a.s.l.
[PT.BA-18]	Bragança, Macedo de Cavaleiros, Morais, 41°29'44.4"N, 6°47'00.4"W, 664m a.s.l.
[PT.BA-19]	Bragança, Macedo de Cavaleiros, Podence e Santa Combinha (Paisagem Protegida da Albufeira do Azibo), 41°34'49.5"N, 6°54'38.3"W, 602m a.s.l.

[PT.BA-20]	Bragança, Miranda do Douro, Constantim e Cicouro, 41°37'53.0"N, 6°16'29.1"W, 816m a.s.l.
[PT.BA-21]	Bragança, Miranda do Douro, Miranda do Douro (Parque Natural do Douro Internacional), 41°32'18.2"N, 6°17'14.2"W, 686m a.s.l.
[PT.BA-22]	Bragança, Miranda do Douro, Vila Chã de Braciosa (Parque Natural do Douro Internacional), 41°25'29.8"N, 6°18'29.4"W, 602m a.s.l.
[PT.BA-23]	Bragança, Mirandela, Avantos e Romeu, 41°31'41.0"N, 7°04'16.1"W, 372m a.s.l.
[PT.BA-24]	Bragança, Vimioso, Algos, Campo de Víboras e Uva, 41°29'40.8"N, 6°31'30.7"W, 470m a.s.l.
[PT.BA-25]	Bragança, Vimioso, Algos, Campo de Víboras e Uva, 41°29'32.2"N, 6°31'36.1"W, 465m a.s.l.
[PT.BA-26]	Bragança, Vinhais, Quirás e Pinheiro Novo (Parque Natural de Montesinho), 41°57'29.7"N, 7°09'29.9"W, 588m a.s.l.
[PT.BA-27]	Bragança, Vinhais, Tuizelo (Parque Natural de Montesinho), 41°54'20.3"N, 7°01'47.4"W, 935m a.s.l.
[PT.CB-01]	Castelo Branco, Castelo Branco, Monforte da Beira (Monte Barata, Parque Natural do Tejo Internacional), 39°42'33.5"N, 7°18'59.3"W, 250m a.s.l.
[PT.CB-02]	Castelo Branco, Covilhã, Cortes do Meio (Alto da Pedrice, Parque Natural da Serra da Estrela), 40°18'38.83"N, 7°34'35.14"W, 1642m a.s.l.
[PT.CB-03]	Castelo Branco, Covilhã, Unhais da Serra (Parque Natural da Serra da Estrela), 40°18'12.2"N, 7°35'21.8"W, 1325m a.s.l.
[PT.CO-01]	Coimbra, Coimbra, Taveiro, Ameal e Arzila (Reserva Natural do Paul de Arzila), 40°10'45.0"N, 8°33'18.7"W, 25m a.s.l.
[PT.CO-02]	Coimbra, Condeixa-a-Nova, Furadouro, 40°03'33.9"N, 8°30'30.5"W, 376m a.s.l.
[PT.CO-03]	Coimbra, Figueira da Foz, Vila Verde, 40°07'59.6"N, 8°50'40.6"W, 1m a.s.l.
[PT.FA-01]	Faro, Loulé, Almancil (Parque Natural da Ria Formosa), 37°01'31.8"N, 8°00'20.4"W, 4m a.s.l.
[PT.FA-02]	Faro, Loulé, Querença, Tôr e Benafim (Paisagem Protegida Local da Fonte Benémola), 37°12'29.2"N, 8°00'29.7"W, 153m a.s.l.
[PT.FA-03]	Faro, Silves, Alcantarilha e Pêra, 37°06'09.8"N, 8°20'49.1"W, 4m a.s.l.
[PT.FA-04]	Faro, Vila do Bispo, Budens (Parque Natural do Sudoeste Alentejano e Costa Vicentina), 37°04'28.7"N, 8°48'10.7"W, 6m a.s.l.
[PT.GU-01]	Guarda, Almeida, Almeida, 40°44'28.4"N, 6°57'12.8"W, 498m a.s.l.
[PT.GU-02]	Guarda, Gouveia, Aldeias e Mangualde da Serra (Parque Natural da Serra da Estrela), 40°27'16.31"N, 7°35'51.22"W, 1060m a.s.l.
[PT.GU-03]	Guarda, Gouveia, Folgoso (Parque Natural da Serra da Estrela), 40°30'14.58"N, 7°30'56.24"W, 960m a.s.l.
[PT.GU-04]	Guarda, Manteigas, São Pedro (Parque Natural da Serra da Estrela), 40°22'10.4"N, 7°33'04.4"W, 987m a.s.l.
[PT.GU-05]	Guarda, Manteigas, São Pedro (Poço do Inferno, Parque Natural da Serra da Estrela), 40°22'21.7"N, 7°31'00.1"W, 1100m a.s.l.
[PT.GU-06]	Guarda, Sabugal, Aldeia da Ribeira, Vilar Maior e Badamalos (Vale Carapito), 40°29'14.0"N, 6°56'47.8"W, 675m a.s.l.
[PT.GU-07]	Guarda, Sabugal, Quadrazais (Reserva Natural da Serra da Malcata), 40°18'30.6"N, 6°59'08.7"W, 836m a.s.l.
[PT.GU-08]	Guarda, Seia, Alvoco da Serra (Parque Natural da Serra da Estrela), 40°18'20.45"N, 7°41'13.91"W, 900m a.s.l.
[PT.GU-09]	Guarda, Seia, Loriga (Parque Natural da Serra da Estrela), 40°19'45.86"N, 7°37'59.99"W, 1766m a.s.l.
[PT.GU-10]	Guarda, Seia, Seia, São Romão e Lapa dos Dinheiros (Parque Natural da Serra da Estrela), 40°22'17.69"N, 7°40'33.16"W, 1004m a.s.l.
[PT.GU-11]	Guarda, Seia, Valezim (Parque Natural da Serra da Estrela), 40°22'30.8"N, 7°42'46.4"W, 604m a.s.l.
[PT.GU-12]	Guarda, Seia, Valezim (Parque Natural da Serra da Estrela), 40°22'1.47"N, 7°43'28.75"W, 687m a.s.l.
[PT.LE-01]	Leiria, Alcobaça, Cela, 39°30'21.3"N, 9°01'37.2"W, 70m a.s.l.
[PT.LE-02]	Leiria, Caldas da Rainha, Tornada e Salir do Porto, 39°28'28.06"N, 9°09'25.76"W, 25m a.s.l.
[PT.LE-03]	Leiria, Porto de Mós, Arrimal e Mendiga (Parque Natural das Serras de Aire e Candeeiros), 39°30'02.3"N, 8°50'36.3"W, 360m a.s.l.
[PT.LI-01]	Lisboa, Sintra, Almagem do Bispo, Pero Pinheiro e Montelavar, 38°50'31.43"N, 9°15'36.34"W, 275m a.s.l.
[PT.LI-02]	Lisboa, Torres Vedras, A dos Cunhados e Maceira, 39°08'41.82"N, 9°16'16.62"W, 25m a.s.l.

[PT.LI-03]	Lisboa, Torres Vedras, A dos Cunhados e Maceira (Casal da Serra), 39°09'56.20"N, 9°20'31.53"W, 50m a.s.l.
[PT.PA-01]	Portalegre, Marvão, Santa Maria de Marvão (Parque Natural da Serra de São Mamede), 39°23'49.2"N, 7°21'51.4"W, 607m a.s.l.
[PT.PA-02]	Portalegre, Portalegre, Ribeira de Nisa e Carreiras, 39°19'53.5"N, 7°25'23.4"W, 590m a.s.l.
[PT.PO-01]	Porto, Paredes, Aguiar de Sousa (Parque das Serras do Porto), 41°07'39.6"N, 8°25'37.9"W, 72m a.s.l.
[PT.PO-02]	Porto, Paredes, Sobreira (Parque das Serras do Porto), 41°06'16.8"N, 8°23'23.2"W, 109m a.s.l.
[PT.PO-03]	Porto, Porto, Lordelo do Ouro e Massarelos, 41°08'58.9"N, 8°37'36.0"W, 70m a.s.l.
[PT.PO-04]	Porto, Porto, Lordelo do Ouro e Massarelos (Jardim Botânico do Porto), 41°09'10.0"N, 8°38'35.1"W, 66m a.s.l.
[PT.PO-05]	Porto, Porto, Lordelo do Ouro e Massarelos (Jardins do Palácio de Cristal), 41°08'53.1"N, 8°37'33.6"W, 82m a.s.l.
[PT.PO-06]	Porto, Porto, Lordelo do Ouro e Massarelos (Parque de Serralves), 41°09'28.9"N, 8°39'25.3"W, 46m a.s.l.
[PT.PO-07]	Porto, Póvoa de Varzim, Aver-o-Mar, Amorim e Terroso, 41°23'59.8"N, 8°45'07.5"W, 22m a.s.l.
[PT.PO-08]	Porto, Póvoa de Varzim, Aver-o-Mar, Amorim e Terroso (Passo), 41°25'08.34"N, 8°44'19.77"W, 50m a.s.l.
[PT.PO-09]	Porto, Póvoa de Varzim, Estela, 41°27'52.73"N, 8°45'54.18"W, 12m a.s.l.
[PT.PO-10]	Porto, Valongo, Campo e Sobrado (Parque das Serras do Porto), 41°10'31.9"N, 8°28'48.5"W, 86m a.s.l.
[PT.PO-11]	Porto, Valongo, Valongo (Parque das Serras do Porto), 41°09'33.4"N, 8°29'05.6"W, 50–100m a.s.l.
[PT.PO-12]	Porto, Vila do Conde, Labruge, 41°17'10.4"N, 8°43'53.5"W, 5m a.s.l.
[PT.PO-13]	Porto, Vila do Conde, Malta e Canidelo, 41°18'17.25"N, 8°39'38.10"W, 65m a.s.l.
[PT.PO-14]	Porto, Vila do Conde, Mindelo (Paisagem Protegida Regional do Litoral de Vila do Conde e Reserva Ornitológica de Mindelo), 41°19'13.9"N, 8°44'07.5"W, 5–20m a.s.l.
[PT.PO-15]	Porto, Vila do Conde, Vilarinho (+45km), UTM: 29T 527.2 - 4576.3
[PT.PO-16]	Porto, Vila Nova de Gaia, Arcozelo, 41°03'12.3"N, 8°39'18.0"W, 10m a.s.l.
[PT.PO-17]	Porto, Vila Nova de Gaia, Avintes (Parque Biológico de Gaia), 41°06'00.0"N, 8°33'35.3"W, 50m a.s.l.
[PT.PO-18]	Porto, Vila Nova de Gaia, Canidelo, 41°08'20.7"N, 8°39'55.2"W, 10m a.s.l.
[PT.SA-01]	Santarém, Abrantes, Mouriscas, 39°28'02.0"N, 8°04'41.0"W, 50m a.s.l.
[PT.SA-02]	Santarém, Constância, Santa Margarida da Coutada, 39°26'23.3"N, 8°16'50.7"W, 75m a.s.l.
[PT.SA-03]	Santarém, Ferreira do Zêzere, Areias e Pias, 39°45'20.6"N, 8°25'12.3"W, 139m a.s.l.
[PT.SA-04]	Santarém, Ferreira do Zêzere, Chãos, 39°43'43.7"N, 8°24'38.0"W, 196m a.s.l.
[PT.SA-05]	Santarém, Ourém, Freixianda, Ribeira do Fário e Formigais, 39°40'39.4"N, 8°26'19.1"W, 86m a.s.l.
[PT.SA-06]	Santarém, Tomar, Além da Ribeira e Pedreira, 39°39'33.7"N, 8°25'09.4"W, 82m a.s.l.
[PT.SA-07]	Santarém, Tomar, Tomar (São João Baptista) e Santa Maria dos Olivais, 39°36'04.7"N, 8°25'26.5"W, 128m a.s.l.
[PT.SA-08]	Santarém, Torres Novas, Olaia e Paço, 39°31'46.66"N, 8°28'10.13"W, 66m a.s.l.
[PT.SE-01]	Setúbal, Palmela, Poceirão e Marateca, 38°35'03.0"N, 8°41'30.1"W, 13m a.s.l.
[PT.VC-01]	Viana do Castelo, Caminha, Vilar de Mouros, 41°52'20.6"N, 8°48'56.3"W, 25m a.s.l.
[PT.VC-02]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°02'15.3"N, 8°08'33.9"W, 1071m a.s.l.
[PT.VC-03]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°02'08.2"N, 8°09'20.7"W, 950m a.s.l.
[PT.VC-04]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°02'23.6"N, 8°12'14.2"W, 873m a.s.l.
[PT.VC-05]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°01'32.8"N, 8°08'18.8"W, 980m a.s.l.
[PT.VC-06]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°00'09.3"N, 8°10'09.6"W, 794m a.s.l.
[PT.VC-07]	Viana do Castelo, Melgaço, Castro Laboreiro e Lamas de Mouro (Parque Nacional da Peneda-Gerês), 42°00'28.5"N, 8°10'08.9"W, 808m a.s.l.
[PT.VC-08]	Viana do Castelo, Paredes de Coura, Bico e Cristelo (Paisagem Protegida de Corno de Bico), 41°52'03.3"N, 8°31'17.7"W, 825m a.s.l.

[PT.VC-09]	Viana do Castelo, Ponte de Lima, Labruja, 41°50'26.3"N, 8°35'11.7"W, 130m a.s.l.
[PT.VC-10]	Viana do Castelo, Viana do Castelo, Carreço, 41°45'52.5"N, 8°52'38.0"W, 3m a.s.l.
[PT.VC-11]	Viana do Castelo, Viana do Castelo, Vila Nova de Anha, 41°40'08.9"N, 8°49'25.7"W, 10m a.s.l.
[PT.VR-01]	Vila Real, Mondim de Basto, Ermelo e Pardelhas (Varzigueiro, Parque Natural do Alvão), 41°22'44.0"N, 7°51'14.4"W, 750m a.s.l.
[PT.VR-02]	Vila Real, Montalegre, Paradela, Contim e Fiães, 41°47'51.1"N, 7°52'33.2"W, 905m a.s.l.
[PT.VR-03]	Vila Real, Montalegre, Pitões das Júnias (Parque Nacional da Peneda-Gerês), 41°49'48.7"N, 7°57'01.3"W, 962m a.s.l.
[PT.VR-04]	Vila Real, Vila Real, Borbela e Lamas de Olo (Parque Natural do Alvão), 41°22'27.6"N, 7°48'23.7"W, 975m a.s.l.
[PT.VR-05]	Vila Real, Vila Real, Campeã, 41°16'44.0"N, 7°53'50.3"W, 872m a.s.l.
[PT.VI-01]	Viseu, Cinfães, Tendais, 41°00'38.5"N, 8°01'57.6"W, 533m a.s.l.
[PT.VI-02]	Viseu, Resende, Ovadas e Panchorra, 41°00'50.1"N, 7°58'31.5"W, 1030m a.s.l.
[PT.VI-03]	Viseu, Tabuaço, Granja do Têdo, 41°03'50.9"N, 7°36'53.0"W, 343m a.s.l.
[PT.VI-04]	Viseu, Tabuaço, Pinheiros e Vale de Figueira, 41°07'08.5"N, 7°36'29.2"W, 637m a.s.l.

Results

Genera and species are listed in alphabetical order.

Adia Robineau-Desvoidy, 1830

In Europe, two species are known from the genus *Adia* (Michelsen, 2013).

One species has so far been found in Portugal: *A. cinerella* (Fallén).

Adia species are common throughout Europe; adult flies are typically found near stables, compost heaps (observation by the second author) and on flowers.

Larvae are known to develop in various types of dung, such as cow, horse, pig, sheep and marmot dung (Hennig, 1966-1976; Ferrar, 1987; Pont & Ackland, 1995).

Adia cinerella (Fallén, 1825) (Fig. 4a)

1♂, [PT.PO-10], SW, 16.viii.2010, leg. RA; 1♂, [PT.BE-02], SW, 7.v.2012, leg. RA; 1♂, [PT.PO-14], SW, 13.v.2013, leg. RA; 1♂1♀, [PT.BR-10], YPT, 16.viii.2013, leg. RA; 1♂, [PT.LE-01], SW, 12.ix.2013, leg. RA; 1♂1♀, [PT.GU-03], SW, 28.vii.2014, leg. AG; 1♂, [PT.BR-02], SW, 27.viii.2014, leg. RA; 1♀, [PT.CB-02], SW, 2.ix.2014, leg. AG; 1♀, [PT.BE-10], SW, 15.xi.2014, leg. AG; 1♂, [PT.BR-02], SW, 25.x.2015, leg. RA; 2♂♂3♀♀, [PT.FA-04], SW, 2.x.2016, leg. RA; 3♀♀, [PT.PO-14], SW, 17.i.2017, leg. RA; 1♂, [PT.AV-01], SW, 22.ii.2017, leg. RA; 1♂, [PT.PO-14], SW, 17.iii.2017, leg. RA; 2♂♂, [PT.AV-01], SW, 7.v.2017, leg. RA; 1♂, [PT.VR-04], SW, 23.v.2017, leg. RA; 1♂, [PT.AV-01], SW, 21.xi.2017, leg. RA; 3♂♂4♀♀, [PT.BR-02], SW, 27.xi.2017, leg. RA; 1♂1♀, [PT.PO-14], SW, 4.v.2018, leg. RA; 1♂2♀♀, [PT.BA-05], SW, 18.v.2018, leg. RA; 1♂, [PT.BA-14], SW, 16.vi.2018, leg. RA; 1♂, [PT.BA-10], SW, 25.vii.2018, leg. RA; 1♀, [PT.BR-07], SW, 11.ix.2018, leg. RA; 1♂, [PT.AV-01], SW, 24.x.2018, leg. RA; 1♂, [PT.AV-01], SW, 16.xi.2018, leg. RA; 1♂1♀, [PT.FA-03], SW, 12.vi.2020, leg. RA; 1♂, [PT.BA-10], SW, 19.vii.2020, leg. RA; 1♀, [PT.BE-06], SW, 7.iv.2021, leg. RA; 3♂♂2♀♀, [PT.BE-04], SW, 9.iv.2021, leg. RA.

Distribution: Widely distributed throughout the Holarctic and Oriental regions.

Anthomyia Meigen, 1803

In Europe, 15 species of *Anthomyia* are known (Michelsen, 2013). Of these, six were previously known from Portugal, including a species endemic to Madeira. The present work reports two additional species to the list: *A. liturata* (Robineau-Desvoidy) and *A. monilis* (Meigen).

Anthomyia species are mostly known for their typical black and white colour pattern on the thorax and the abdomen, as is the case with *A. pluvialis*. Less well known are the species within this genus that do not have this typical pattern (such as *A. liturata* and *A. monilis*). *A. liturata* also has clearly darkened crossveins, a characteristic that it shares, among the European Anthomyiidae, with only *A. confusanea*. Both species are easy to mix up, and genital preparation is mostly needed (Van Erkelens *et al.*, 2021).

The larvae develop on organic waste, mushrooms and bird droppings (Ferrar, 1987; Michelsen & Báez, 1985).

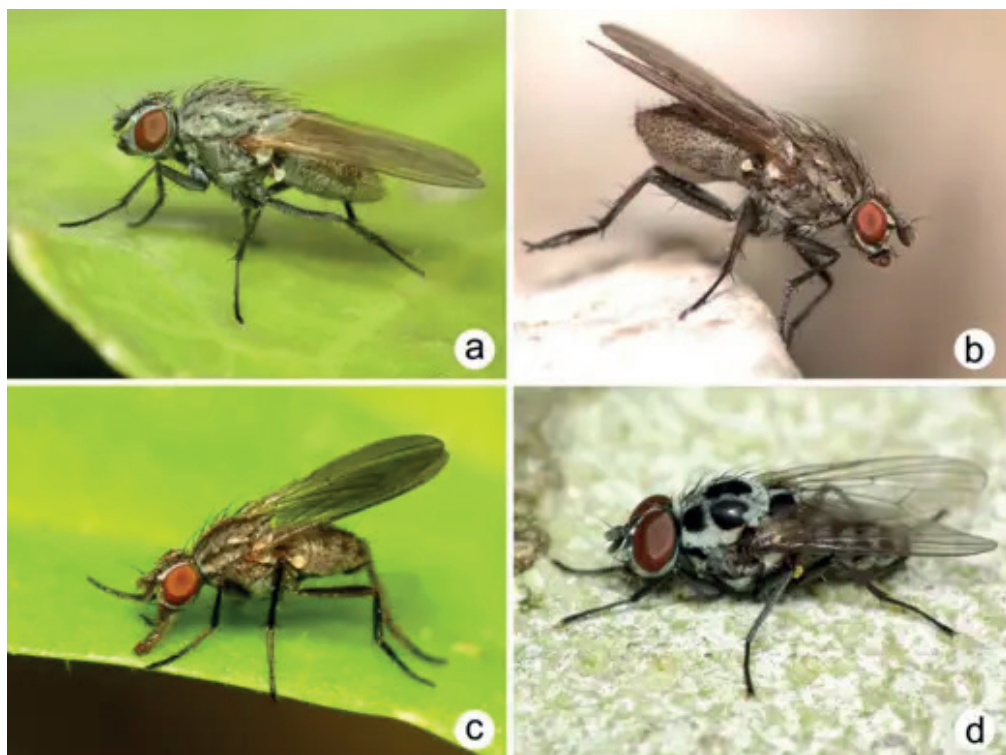


Fig. 4: Adult anthomyiids: a) *Adia cinerella* (Fallén) (♀); b) *Anthomyia confusanea* Michelsen (♀); c) *Anthomyia monilis* (Meigen) (♂); d) *Anthomyia pluvialis* (Linnaeus) (♂).

***Anthomyia confusanea* Michelsen in Michelsen & Báez, 1985 (Fig. 4b)**

1♀, [PT.BE-08], SW, 8.v.2012, leg. RA; 2♂♂1♀, [PT.LE-03], MT, 13.vi – 02.vii.2013, leg. Francisco Barros; 1♂3♀♀, [PT.LE-02], SW, 1.xi.2013, leg. RA; 1♂, [PT.GU-12], SW, 30.vii.2014, leg. AG; 1♀, [PT.BE-12], SW, 16.xi.2014, leg. RA; 1♀, [PT.FA-01], SW, 30.ix.2016, leg. RA; 1♀, [PT.FA-04], SW, 2.x.2016, leg. RA; 1♀, [PT.BA-11], SW, 15.v.2018, leg. RA; 1♂, [PT.VC-11], SW, 27.iv.2019, leg. RA; 1♀, [PT.SA-06], SW, 11.vii.2020, leg. RA & AG; 1♀, [PT.SA-04], SW, 14.vii.2020, leg. RA; 1♂, [PT.BE-05], SW, 6.iv.2021, leg. RA; 1♂3♀♀, [PT.BE-06], SW, 7.iv.2021, leg. RA; 3♂♂2♀♀, [PT.BE-09], SW, 8.iv.2021, leg. RA; 2♂♂, [PT.BE-04], SW, 9.iv.2021, leg. RA; 1♂, [PT.BE-03], SW, 10.iv.2021, leg. RA.

Distribution: Distributed across the western Palaearctic, from the Canary Islands to Kashmir.

***Anthomyia imbrida* Rondani, 1866**

4♂♂, [PT.GU-11], SW, 30.vii.2014, leg. AG; 1♂, [PT.BA-11], SW, 15.v.2018, leg. RA; 1♂, [PT.SA-05], SW, 26.vi.2018, leg. RA; 1♂, [PT.BA-10], SW, 25.vii.2018, leg. RA.

Distribution: Widely distributed across the Palaearctic, from Europe and North Africa, through the Middle East to China.

***Anthomyia liturata* (Robineau-Desvoidy, 1830) (Fig. 15)**

1♂, [PT.PO-03], HC, 25.viii.2012, leg. RA; 1♂, [PT.PO-14], SW, 17.iii.2017, leg. RA; 1♀, [PT.BR-02], SW, 12.iii.2019, leg. RA; 1♂, [PT.PO-07], SW, 28.vi.2019, leg. RA; 1♂, [PT.PO-07], SW, 20.vii.2019, leg. RA.

Distribution: Distributed throughout most of Europe. Michelsen & Báez (1985) mention that this species is common in Central and Northern Europe, but that it penetrates the Mediterranean subregion at higher altitudes. In Portugal, the species was found at low altitudes in the north of the country in areas under Atlantic influence. First record from Portugal.

***Anthomyia monilis* (Meigen, 1826) (Fig. 4c)**

1♂, [PT.PO-10], SW, 1.vii.2013, leg. RA; 2♂♂, [PT.PO-11], SW, 20.iii.2023, leg. RA (RA coll.).

Distribution: Widespread in Europe. First record from Portugal.

***Anthomyia pluvialis* (Linnaeus, 1758) (Fig. 4d)**

6♂♂, [PT.BR-02], SW, 10.ii.2011, leg. RA; 2♂♂, [PT.AV-02], SW, 14.ix.2011, leg. RA; 1♂, [PT.PO-10], SW, 9.iv.2012, leg. RA; 1♀, [PT.BR-02], SW, 15.iv.2012, leg. RA; 1♂, [PT.PO-04], HC, 27.iv.2012, leg. RA; 1♂1♀, [PT.BR-02], SW, 21.v.2012, leg. RA; 1♂, [PT.BR-03], MT, 21.v – 4.vi.2012, leg. RA; 2♂♂, [PT.AV-02], SW, 6.iv.2013, leg. RA; 1♂, [PT.BR-11], SW, 28.vi.2013, leg. RA; 1♂, [PT.PO-10], SW, 1.vii.2013, leg. RA; 1♂1♀, [PT.SA-08], SW, 12.x.2013, leg. AG; 1♀, [PT.PO-15], 24.iii.2014, leg. André van Eck; 1♀, [PT.CB-01], SW, 12.iv.2014, leg. RA; 1♀, [PT.GU-08], SW, 30.vii.2014, leg. AG; 1♂, [PT.PA-02], SW, 14.iii.2015, leg. RA; 2♂♂, [PT.BR-02], SW, 16.iv.2015, leg. RA; 1♀, [PT.BA-13], SW, 3.x.2015, leg. RA; 1♂, [PT.BA-03], SW, 31.v.2016, leg. RA; 2♂♂, [PT.PO-12], SW, 29.vii.2016, leg. RA; 1♂1♀, [PT.BA-18], SW, 13.ix.2017, leg. RA; 1♂, [PT.PO-04], HC, 30.xi.2017, leg. RA; 1♀, [PT.PO-11], SW, 21.iii.2018, leg. RA; 1♂2♀♀, [PT.BR-02], SW, 15.iv.2018, leg. RA; 1♀, [PT.BR-07], SW, 17.iv.2018, leg. RA; 1♂, [PT.PO-14], SW, 4.v.2018, leg. RA; 1♂1♀, [PT.AV-01], SW, 16.xi.2018, leg. RA; 1♂, [PT.AV-01], SW, 25.i.2019, leg. RA; 1♂, [PT.SA-06], SW, 12.vii.2020, leg. AG; 1♂, [PT.VR-03], SW, 2.ix.2020, leg. RA; 1♂, [PT.AV-01], SW, 30.ix.2020, leg. RA; 2♂♂, [PT.PO-05], HC, 15.iii.2021, leg. RA; 2♂♂1♀, [PT.BE-07], SW, 8.iv.2021, leg. RA.

Distribution: Widely distributed across the Palaearctic and India, and introduced in the Nearctic and Australia.

***Anthomyia procellaris* Rondani, 1866**

1♂, [PT.PO-13], YPT, 14.vi.2013, leg. RA; 1♂, [PT.BA-27], SW, 21.vi.2015, leg. RA; 2♂♂, [PT.BR-02], SW, 29.iii.2017, leg. RA; 1♂, [PT.BR-08], SW, 24.v.2019, leg. RA; 1♂, [PT.PO-07], SW, 28.vi.2019, leg. RA.

Distribution: Distributed throughout the Holarctic region.

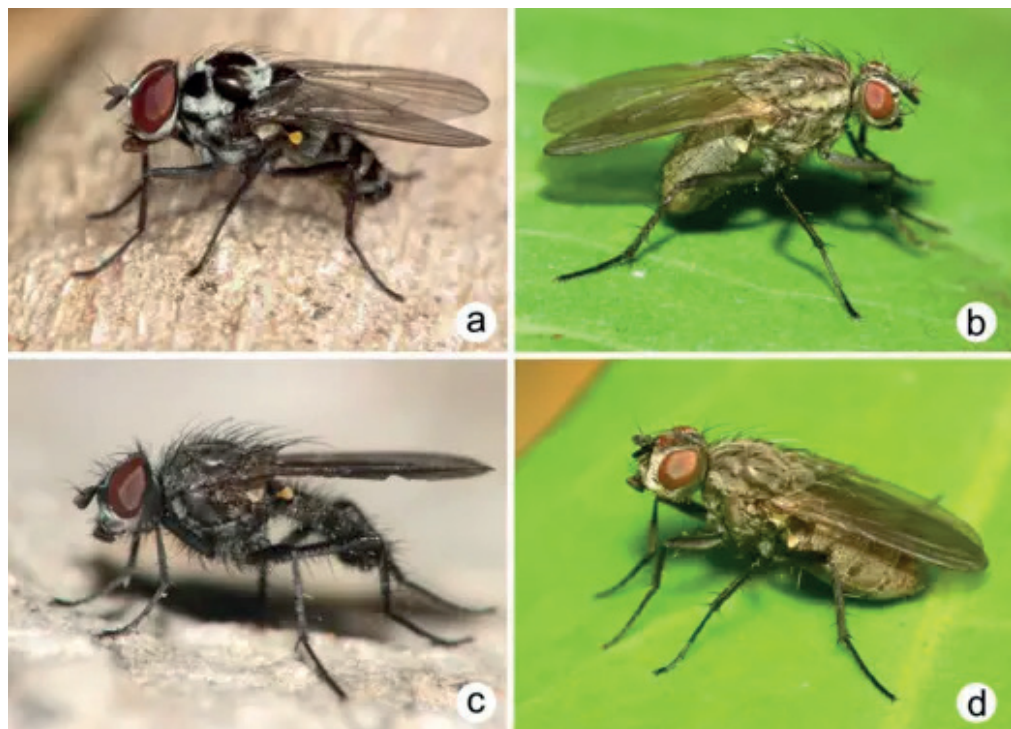


Fig. 5: Adult anthomyiids: a) *Anthomyia quinquemaculata* Macquart (♂); b) *Botanophila brunneilinea* (Zetterstedt) (♀); c) *Botanophila* cf. *laterella* (Collin) (♂); d) *Botanophila striolata* (Fallén) (♀).

***Anthomyia quinquemaculata* Macquart, 1839 (Fig. 5a)**

2♂♂3♀♀, [PT.PO-17], SW, 1.iv.2009, leg. RA; 8♂♂1♀, [PT.BR-02], SW, 14.iv.2012, leg. RA; 1♂, [PT.BR-02], SW, 16.iv.2012, leg. RA; 1♂, [PT.PO-17], SW, 4.ii.2013, leg. RA; 1♂, [PT.PO-09], SW, 18.vii.2013, leg. RA; 1♂, [PT.SA-08], SW, 12.x.2013, leg. AG; 1♂1♀, [PT.PO-10], SW, 30.x.2013, leg. RA; 1♂1♀, [PT.PO-17], SW, 29.iii.2014, leg. RA; 1♂, [PT.AV-02], SW, 10.vii.2014, leg. RA; 1♀, [PT.FA-02], SW, 12.vii.2014, leg. RA; 1♀, [PT.BR-02], SW, 2.ix.2014, leg. RA; 1♂, [PT.BA-25], SW, 18.vi.2015, leg. RA; 2♂♂, [PT.BR-02], SW, 26.xii.2015, leg. RA; 1♂, [PT.BR-09], SW, 9.iv.2017, leg. RA; 1♂, [PT.BR-02], SW, 18.iv.2017, leg. RA; 2♂♂, [PT.PO-04], HC, 5.iv.2018, leg. RA; 6♂♂8♀♀, [PT.BR-02], SW, 16.iv.2018, leg. RA; 1♂, [PT.AV-01], SW, 26.iv.2018, leg. RA; 1♂, [PT.BA-23], SW, 18.v.2018, leg. RA; 1♀, [PT.VR-01], SW, 15.x.2020, leg. RA; 1♂1♀, [PT.PO-05], HC, 15.iii.2021, leg. RA; 1♂, [PT.BE-06], SW, 8.iv.2021, leg. RA.

Distribution: Present in the Canary Islands, Southern Europe and North Africa. This species is recorded for mainland Portugal in Fauna Europaea (Michelsen, 2013), although we do not know the original publication on which this record was based. In any case, we can confirm the presence of this species in this territory.

***Botanophila* Lioy, 1864**

In Europe, 70 species of *Botanophila* are known (Michelsen, 2013). In Portugal no records had been made of any *Botanophila* species, until now. In total, we now record four species: *B. brunneilinea* (Zetterstedt), *B. fugax* (Meigen), *B. lobata* (Collin) and *B. striolata* (Fallén).

Botanophila species vary in length from 3-9 mm and are mostly dark coloured. Some of the species are common and can be seen in city gardens on a wide range of flowers, but most in grasslands or along forest edges, and are barely perceptible to the naked eye. Some species are considered agricultural pests.

B. brunneilinea, *B. fugax* and *B. striolata* belong to a large group of species in which the larvae are associated with plants, living on young sprouts of plants, various types of cabbage and rotting plant material (Hennig, 1966-1976). For *B. lobata* on the other hand, larvae are specialist feeders on grass-infecting fungi of the genus *Epichloë* (Fig. 1a) (Lembicz *et al.*, 2013; Leuchtman & Michelsen, 2016).

***Botanophila brunneilinea* (Zetterstedt, 1845) (Fig. 5b)**

1♀, [PT.VC-05], SW, 10.ix.2016, leg. RA; 1♀, [PT.VR-02], SW, 23.ix.2016, leg. RA; 1♂, [PT.VI-02], SW, 5.vi.2020, leg. RA.

Distribution: Europe and Near East. First record from Portugal.

***Botanophila fugax* (Meigen, 1826)**

1♂, [PT.BA-07], SW, 8.viii.2014, leg. RA; 1♂, [PT.BA-01], SW, 2.vi.2016, leg. RA; 1♂, [PT.VC-03], SW, 9.ix.2016, leg. RA; 1♂, [PT.BR-08], SW, 24.v.2019, leg. RA.

Distribution: Widely distributed across the Holarctic region. First record from Portugal.

***Botanophila lobata* (Collin, 1967)**

1♂, [PT.VC-11], SW, 27.iv.2019, leg. RA.

Distribution: Holarctic region. First record from Portugal.

***Botanophila striolata* (Fallén, 1824) (Figs. 5d; 16)**

1♂, [PT.PO-10], SW, 9.iv.2012, leg. RA; 1♂, [PT.LE-01], SW, 1.xi.2013, leg. RA; 1♀, [PT.BA-01], SW, 2.vi.2016, leg. RA; 1♂, [PT.BA-27], SW, 6.vi.2016, leg. RA; 5♂♂1♀, [PT.AV-01], SW, 9.iii.2017, leg. RA; 1♂3♀♀, [PT.PO-14], SW, 17.iii.2017, leg. RA; 1♂1♀, [PT.AV-01], SW, 7.v.2017, leg. RA; 1♂, [PT.PO-14], SW, 19.v.2017, leg. RA; 1♂, [PT.AV-01], SW, 1.x.2017, leg. RA; 1♂, [PT.AV-01], SW, 21.ii.2018, leg. RA; 3♂♂2♀♀, [PT.PO-14], SW, 4.v.2018, leg. RA; 4♂♂3♀♀, [PT.BA-07], SW, 17.v.2018, leg. RA; 2♂♂, [PT.BA-05], SW, 18.v.2018, leg. RA; 1♀, [PT.GU-07], SW, 9.x.2019, leg. RA.

Distribution: Widely distributed across the Palaearctic region. First record from Portugal.

***Calythea* Schnabl & Dziedzicki, 1911**

In Europe, four species of *Calythea* are known (Michelsen, 2013). In Portugal no records of any *Calythea* species were made; we now add *C. nigricans* (Robineau-Desvoidy).

Typical for *Calythea* species is the black and white pattern on thorax and abdomen. The flies are small (3-4 mm) and, on warm days, can form swarms composed mainly of hovering males, frequently under tree branches (Chandler, 2015; Hennig, 1966-1976).

The larvae are coprophagous on faeces of mammals (Hennig, 1966-1976). The second author has recorded many females of *C. nigricans* around bovine droppings.

***Calythea nigricans* (Robineau-Desvoidy, 1830) (Fig. 6a)**

1♂1♀, [PT.BA-07], SW, 9.ix.2014, leg. RA; 1♂, [PT.BA-13], SW, 3.x.2015, leg. RA.

Distribution: Mainly distributed throughout the Palaearctic region. First record from Portugal.



Fig. 6: Adult anthomyiids: a) *Calythea nigricans* (Robineau-Desvoidy) (♂); b) *Chiroisia flavipennis* (Fallén) (♀); c) *Delia brunnescens* (Zetterstedt) (♂); d) *Delia penicillosa* Hennig (♀).

***Chiroisia* Rondani, 1856**

In Europe, 13 species of *Chiroisia* are known (Michelsen, 2013).

In Portugal no records had been made of any *Chiroisia* species, until now. We now add six species to the list: *C. albitarsis* (Zetterstedt), *C. betuleti* (Ringdahl), *C. flavipennis* (Fallén), *C. griseifrons* (Séguy), *C. grossicauda* (Strobl) and *C. histricina* (Rondani).

Adults of most species are dark coloured and body lengths can vary from 3-8 mm.

All larvae of this genus are miners on ferns (Hennig, 1966-1976). The second author has reared, in the Netherlands, several *Chiroisia* larvae from ferns, including *C. betuleti* from *Dryopteris dilatata* (Fig. 1b, c). In these species, the larvae nest on the top leaves of the fern, which are typically intertwined; in these the larvae are thus protected from external hazards, and can feast on the leaves of the fern.

***Chiroisia albitarsis* (Zetterstedt, 1845)**

1♂, [PT.PO-10], SW, 9.iv.2012, leg. RA; 1♀, [PT.BA-05], SW, 18.v.2018, leg. RA.

Distribution: Known from the Palaearctic and Oriental regions. First record from Portugal.

***Chirosia betuleti* (Ringdahl, 1935) (Fig. 1b, c)**

1♂2♀♀, [PT.VC-02], SW, 1.v.2019, leg. RA.

Distribution: Palaearctic region. First record from Portugal.

***Chirosia flavipennis* (Fallén, 1823) (Fig. 6b)**

1♂, [PT.PO-10], SW, 12.v.2011, leg. RA; 2♂♂, [PT.BR-01], SW, 15.iv.2013, leg. RA; 1♂, [PT.PO-10], SW, 31.v.2013, leg. RA; 1♂, [PT.BR-08], SW, 15.vi.2013, leg. RA; 1♀, [PT.VR-01], SW, 2.ix.2013, leg. RA; 1♂, [PT.VC-06], SW, 29.v.2016, leg. RA; 1♂, [PT.BA-27], SW, 6.vi.2016, leg. RA; 1♀, [PT.PO-10], SW, 21.vi.2016, leg. RA; 2♀♀, [PT.PO-02], SW, 27.iii.2021, leg. RA.

Distribution: Holarctic region. First record from Portugal.

***Chirosia griseifrons* (Séguy, 1923)**

1♂, [PT.PO-10], SW, 13.vi.2012, leg. RA; 1♂, [PT.PO-10], SW, 23.v.2013, leg. RA; 1♂, [PT.PO-10], SW, 31.v.2013, leg. RA; 1♂, [PT.BR-04], SW, 9.iv.2017, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from the Iberian Peninsula.

***Chirosia grossicauda* Strobl, 1899**

1♀, [PT.BA-20], SW, 16.v.2018, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from Portugal.

***Chirosia histricina* (Rondani, 1866)**

1♂, [PT.VC-06], SW, 29.v.2016, leg. RA.

Distribution: Holarctic region. First record from Portugal.

***Delia* Robineau-Desvoidy, 1830**

In Europe, 87 species of *Delia* are known (Michelsen, 2013).

In Portugal five species have been recorded so far, three of which in mainland Portugal. A new species for mainland Portugal and 10 new species for the country can now be added to the list: *D. antiqua* (Meigen), *D. brunnescens* (Zetterstedt), *D. cardui* (Meigen), *D. coronariae* (Hendel), *D. criniventris* (Zetterstedt), *D. echinata* (Séguy), *D. hirticrura* (Rondani), *D. penicillosa* Hennig, *D. pilifemur* (Ringdahl), *D. planipalpis* (Stein) and *D. quadripila* (Stein).

The genus *Delia* contains many species and most of them are associated with plants. They vary in length from 3-9 mm and are mostly dark coloured. They are difficult to identify because of the external and genital similarities between species. Some species are considered as pests to agriculture, especially *D. antiqua* (Fig. 1d), *D. platura* and *D. radicum* (Hennig, 1966-1976).

The genus *Delia* shows great biological variability. Some species are saprophagous, many are leafminers, while others live on the young sprouts of cabbages, cereals or grasses (Ellis, 2007; Ferrar, 1987). There are species that only live around one species of plant, and may therefore also be bound to a certain biotope.

***Delia antiqua* (Meigen, 1826) (Fig. 1d)**

2♂♂, [PT.PO-09], SW, 18.vii.2013, leg. RA; 1♂, [PT.PO-09], SW, 14.viii.2013, leg. RA.

Distribution: Widespread in the Holarctic and Neotropical regions. First record from Portugal.

***Delia bracata* (Rondani, 1866)**

1♂, [PT.BE-10], SW, 15.xi.2014, leg. AG; 2♂♂, [PT.BA-01], SW, 2.vi.2016, leg. RA.

Distribution: Widespread in the Palaearctic, Afrotropical and Oriental regions.

***Delia brunnescens* (Zetterstedt, 1845) (Fig. 6c)**

2♂♂, [PT.BA-16], SW, 16.v.2018, leg. RA; 1♂1♀, [PT.BA-05], SW, 18.v.2018, leg. RA.

Distribution: Palaearctic region. First record from Portugal.

***Delia cardui* (Meigen, 1826)**

1♂, [PT.CB-01], SW, 12.iv.2014, leg. AG.

Distribution: Holarctic region. First record from Portugal.

***Delia coronariae* (Hendel, 1925)**

1♂, [PT.BR-02], SW, 26.xii.2014, leg. RA; 1♂, [PT.AV-01], SW, 28.vii.2017, leg. RA.

Distribution: Holarctic region. First record from the Iberian Peninsula.

***Delia criniventris* (Zetterstedt, 1860)**

1♂, [PT.VC-06], SW, 29.v.2016, leg. RA.

Distribution: Widespread in Europe. First record from the Iberian Peninsula.

***Delia echinata* (Séguy, 1923)**

1♂, [PT.PO-10], SW, 8.ii.2017, leg. RA; 1♂, [PT.PO-14], SW, 4.v.2018, leg. RA; 2♂♂5♀♀, [PT.BA-20], SW, 16.v.2018, leg. RA.

Distribution: Known from the Holarctic and Oriental regions. First record from mainland Portugal (also known from Madeira Island).

***Delia hirticrura* (Rondani, 1871)**

2♂♂2♀♀, [PT.BA-05], SW, 2.x.2015, leg. RA; 2♂♂, [PT.BA-22], SW, 6.x.2015, leg. RA.

Distribution: Known from Southern Europe, North Africa and Near East. First record from the Iberian Peninsula.

***Delia penicillosa* Hennig, 1974 (Fig. 6d)**

1♂, [PT.BA-20], SW, 3.vi.2016, leg. RA; 2♂♂1♀, [PT.BA-10], SW, 19.vii.2020, leg. RA.

Distribution: Palearctic region. First record from Portugal.

***Delia pilifemur* (Ringdahl, 1933)**

1♂, [PT.GU-01], SW, 10.x.2019, leg. RA.

Distribution: Known from Europe and Nearctic region. First record from the Iberian Peninsula.

***Delia planipalpis* (Stein, 1898)**

1♂, [PT.BE-11], SW, 15.xi.2014, leg. RA.

Distribution: Widespread in the Holarctic region. First record from Portugal.

***Delia platura* (Meigen, 1826) (Fig. 7a)**

1♂, [PT.PO-18], YPT, 14.x.2010, leg. RA; 7♂♂1♀, [PT.PO-10], SW, 9.iv.2012, leg. RA; 2♂♂, [PT.BR-02], SW, 16.iv.2012, leg. RA; 21♂♂15♀♀, [PT.BR-03], MT, 21.v – 4.vi.2012, leg. RA; 1♂, [PT.BR-02], SW, 4.vi.2012, leg. RA; 1♂, [PT.PO-06], light trap, 25.v.2013, leg. RA; 3♂♂2♀♀, [PT.PO-13], YPT, 14.vi.2013, leg. RA; 1♂1♀, [PT.BR-11], SW, 28.vi.2013, leg. RA; 4♂♂, [PT.BR-02], SW, 20.vii.2013, leg. RA; 1♂, [PT.LI-02], SW, 19.ix.2013, leg. RA; 1♀, [PT.LI-03], SW, 19.ix.2013, leg. RA; 1♂, [PT.SA-08], SW, 12.x.2013, leg. AG; 1♂, [PT.PO-17], SW, 25.i.2014, leg. RA; 1♂1♀, [PT.CB-01], SW, 12.iv.2014, leg. RA; 2♂♂, [PT.CB-01], SW, 13.iv.2014, leg. AG; 1♂, [PT.VI-03], SW, 27.iv.2014, leg. RA; 1♂, [PT.AV-02], SW, 2.vi.2014, leg. RA; 1♂, [PT.AV-03], SW, 2.vi.2014, leg. RA; 2♂♂, [PT.BR-02], SW, 21.vi.2014, leg. RA; 1♀, [PT.BA-07], SW, 8.viii.2014, leg. RA; 1♀, [PT.CB-03], SW, 2.ix.2014, leg. AG; 1♀, [PT.GU-10], SW, 4.ix.2014, leg. AG; 2♂♂, [PT.BE-10], SW, 15.xi.2014, leg. RA; 1♂, [PT.BE-10], SW, 15.xi.2014, leg. AG; 1♂, [PT.BE-11], SW, 15.xi.2014, leg. RA; 1♂, [PT.BE-12], SW, 16.xi.2014, leg. AG; 1♂1♀, [PT.BR-02], SW, 24.ii.2015, leg. RA; 1♀, [PT.PA-01], SW, 14.iii.2015, leg. RA; 1♂, [PT.BR-02], SW, 15.iv.2015, leg. RA; 4♂♂2♀♀, [PT.BR-02], SW, 16.iv.2015, leg. RA; 4♂♂, [PT.BA-08], SW, 20.vi.2015, leg. RA; 1♀, [PT.BR-02], SW, 25.xii.2015, leg. RA; 1♂, [PT.PO-10], SW, 21.ii.2016, leg. RA; 1♂1♀, [PT.BA-03], SW, 31.v.2016, leg. RA; 1♂, [PT.BA-02], SW, 1.vi.2016, leg. RA; 1♂, [PT.BA-01], SW, 2.vi.2016, leg. RA; 1♂, [PT.PO-04], HC, 3.ix.2016, leg. RA; 1♂, [PT.VC-05], SW, 10.ix.2016, leg. RA; 1♂, [PT.PO-10], SW, 8.ii.2017, leg. RA; 1♂, [PT.AV-01], SW, 22.ii.2017, leg. RA; 3♂♂, [PT.BR-07], SW, 25.iv.2017, leg. RA; 1♂, [PT.VR-04], SW, 23.v.2017, leg. RA; 1♂, [PT.BR-02], SW, 15.vi.2017, leg. RA; 3♀♀, [PT.BA-19], SW, 11.ix.2017, leg. RA; 1♂, [PT.AV-01], SW, 23.x.2017, leg. RA; 3♂♂, [PT.AV-01], SW, 21.ii.2018, leg. RA; 2♂♂1♀, [PT.PO-11], SW, 21.iii.2018, leg. RA; 1♂, [PT.AV-01], SW, 26.iii.2018,

leg. RA; 1♂, [PT.BR-02], SW, 16.iv.2018, leg. RA; 1♂, [PT.BR-07], SW, 17.iv.2018, leg. RA; 2♂♂, [PT.AV-01], SW, 26.iv.2018, leg. RA; 11♂♂, [PT.BR-02], SW, 14.v.2018, leg. RA; 3♂♂4♀♀, [PT.BA-11], SW, 15.v.2018, leg. RA; 1♂1♀, [PT.BA-16], SW, 16.v.2018, leg. RA; 2♂♂, [PT.BA-05], SW, 18.v.2018, leg. RA; 2♂♂1♀, [PT.BR-02], SW, 20.v.2018, leg. RA; 1♂1♀, [PT.BR-02], SW, 21.v.2018, leg. RA; 1♂2♀♀, [PT.BA-14], SW, 16.vi.2018, leg. RA; 2♂♂, [PT.SA-05], SW, 26.vi.2018, leg. RA; 2♂♂1♀, [PT.BA-10], SW, 25.vii.2018, leg. RA; 1♂, [PT.BA-12], SW, 25.vii.2018, leg. RA; 1♂, [PT.PO-11], SW, 9.x.2018, leg. RA; 1♂, [PT.VC-11], SW, 23.iii.2019, leg. RA; 1♂, [PT.VC-11], SW, 27.iv.2019, leg. RA; 4♂♂, [PT.BR-02], SW, 4.v.2019, leg. RA; 1♂, [PT.BR-06], SW, 13.v.2019, leg. RA; 1♂, [PT.BA-10], SW, 4.viii.2019, leg. RA; 2♂♂, [PT.GU-01], SW, 10.x.2019, leg. RA; 1♂, [PT.AV-01], SW, 5.xii.2019, leg. RA; 1♂, [PT.VR-01], SW, 19.v.2020, leg. RA; 2♂♂, [PT.VR-04], SW, 19.v.2020, leg. RA; 1♂, [PT.SA-03], SW, 13.vii.2020, leg. RA & AG; 2♂♂, [PT.BA-10], SW, 19.vii.2020, leg. RA; 1♂, [PT.SE-01], HC, 6.iv.2021, leg. RA; 2♂♂, [PT.BE-05], SW, 6.iv.2021, leg. RA; 4♂♂1♀, [PT.BE-05], SW, 7.iv.2021, leg. RA; 1♂, [PT.BE-07], SW, 8.iv.2021, leg. RA; 2♂♂, [PT.BE-09], SW, 8.iv.2021, leg. RA.

Distribution: Cosmopolitan.

Delia quadripila (Stein, 1916) (Fig. 7b)

1♂, [PT.BR-02], SW, 26.xii.2014, leg. RA; 1♂, [PT.AV-01], SW, 28.vii.2017, leg. RA.

Distribution: Europe. Until now the species was known to be distributed across central and northern Europe. This is the first record of the species in southern Europe.

Delia radicum (Linnaeus, 1758) (Fig. 7c)

5♂♂5♀♀, [PT.BR-03], MT, 21.v – 4.vi.2012, leg. RA; 1♂, [PT.PO-17], SW, 30.iii.2013, leg. RA; 1♂, [PT.PO-17], SW, 1.v.2013, leg. RA; 1♂, [PT.PO-13], YPT, 14.vi.2013, leg. RA; 1♂3♀♀, [PT.PO-08], YPT, 12.vii.2013, leg. RA; 3♂♂, [PT.LI-03], SW, 22.viii.2013, leg. RA; 2♂♂, [PT.LE-01], SW, 12.ix.2013, leg. RA; 2♂♂, [PT.LI-01], SW, 18.ix.2013, leg. RA; 1♂, [PT.LI-03], SW, 19.ix.2013, leg. RA; 1♂, [PT.PO-14], SW, 23.iii.2016, leg. RA; 1♂, [PT.PO-14], SW, 6.iv.2016, leg. RA; 1♂, [PT.AV-01], SW, 7.v.2017, leg. RA; 1♂, [PT.BR-02], SW, 15.vi.2017, leg. RA; 1♂, [PT.PO-11], SW, 21.iii.2018, leg. RA; 1♂1♀, [PT.AV-01], SW, 26.iii.2018, leg. RA; 1♂, [PT.BR-07], SW, 17.iv.2018, leg. RA; 3♂♂2♀♀, [PT.PO-14], SW, 4.v.2018, leg. RA; 1♂, [PT.BR-02], SW, 13.v.2018, leg. RA; 1♂1♀, [PT.AV-01], SW, 17.viii.2018, leg. RA; 1♀, [PT.BR-02], SW, 15.iii.2019, leg. RA; 1♂, [PT.BR-08], SW, 16.iv.2019, leg. RA; 1♀, [PT.PO-07], SW, 23.x.2019, leg. RA; 1♂, [PT.PO-05], HC, 15.iii.2021, leg. RA; 1♂, [PT.PO-01], SW, 27.iii.2021, leg. RA.

Distribution: Widespread in the Holarctic region.

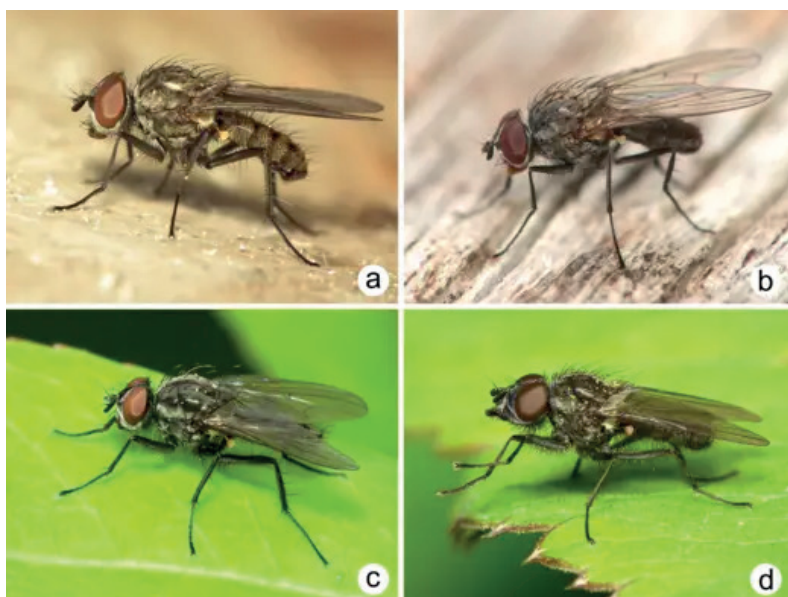


Fig. 7: Adult anthomyiids: a) *Delia platyura* (Meigen) (♂); b) *Delia quadripila* (Stein) (♂); c) *Delia radicum* (Linnaeus) (♂); d) *Egle ciliata* (Walker) (♂).

***Egle* Robineau-Desvoidy, 1830**

In Europe, 18 species of *Egle* are known (Michelsen, 2013).

In Portugal no records had been made of any *Egle* species, until now. Four species are now added: *E. ciliata* (Walker), *E. minuta* (Meigen), *E. parva* (Robineau-Desvoidy) and *E. rhinotmeta* (Pandellé).

Most species of *Egle* are very small, 2-4 mm in length, but some larger species may reach 4-8 mm. All known *Egle* species are associated with willows (*Salix* spp.), with the exception of one species; *Egle concomitans* (Pandellé), which occurs only on *Populus* trees.

Egle species are univoltine and the flight period of each lineage is synchronized with the flowering time and seed development of its respective Salicaceae host.

Adult flies feed on nectar and pollen and are thus important pollinators of willow trees.

The larvae feed inside seed capsules, which hang on the trees in clusters at the end of the flowering period (Fig. 1e). The fatty fully-fed larvae mostly fall down on the ground, but in some species the larvae stay in the seed capsule until the whole capsules falls to the ground (Michelsen, 2009; Van Erkelens, 2013).

***Egle ciliata* (Walker, 1849) (Fig. 7d)**

1♂, [PT.AV-01], SW, 21.ii.2018, leg. RA.

Distribution: Widely distributed throughout the Holarctic region. First record from Portugal.

***Egle minuta* (Meigen, 1826)**

1♂, [PT.AV-01], SW, 25.i.2019, leg. RA.

Distribution: Distributed throughout the Holarctic region, reaching the Oriental region in northern Myanmar. First record from Portugal.

***Egle parva* Robineau-Desvoidy, 1830 (Figs. 8a; 17)**

4♂♂1♀, [PT.PO-17], SW, 9.ii.2013, leg. RA; 1♂4♀♀, [PT.PO-17], SW, 23.ii.2013, leg. RA.

Distribution: Widespread in the Palearctic region. First record from Portugal.

***Egle rhinotmeta* (Pandellé, 1900) (Fig. 8b)**

1♂, [PT.AV-01], SW, 22.ii.2017, leg. RA; 13♂♂1♀, [PT.AV-01], SW, 25.i.2019, leg. RA.

Distribution: Western Palearctic. First record from Portugal.

***Emmesomyia* Malloch, 1917**

In Europe, two species of *Emmesomyia* are known (Michelsen, 2013).

In Portugal no records of *Emmesomyia* species were made until now. One species has been found: *E. socia* (Fallén).

Typical for the genus *Emmesomyia* is the presence of one strong bristle on the anepimeron, which mostly only occurs on one side of the thorax, but which is only visible with a microscope (Hennig, 1966-1976). In the field, they can stand out because the female sometimes has bright yellow lower abdomen. The size of these species is around 4-7 mm.

The biology of *Emmesomyia* species is poorly known. Larvae from *E. socia* have been found in human faeces (Mihályi, 1965). The second author observed adults of *Emmesomyia* several times around compost containing rotting animal waste (Van Erkelens *et al.*, 2021).

***Emmesomyia socia* (Fallén, 1825) (Fig. 8c)**

1♀, [PT.PO-04], HC, 6.ix.2016, leg. RA.

Distribution: Widely distributed in Europe, also present in the Nearctic region. First record from Portugal.

***Eustalomyia* Kowarz, 1873**

In Europe, four species of *Eustalomyia* are known (Michelsen, 2013).

In Portugal no records had been made of any *Eustalomyia* species, until now. Two species have been found: *E. hilaris* (Fallén) and *E. histrio* (Zetterstedt).

Eustalomyia species are relatively large flies, 5-10 mm in length, with a black and white pattern on the thorax and the abdomen. Because of their length and typical black and white pattern, they can stand out in the field. *Eustalomyia* species are nest parasites on several Crabronidae (Hymenoptera) species (Hennig, 1966-1976).

The larvae live on the food reserves that crabronid wasps collected for their own larvae (Hennig, 1966-1976).

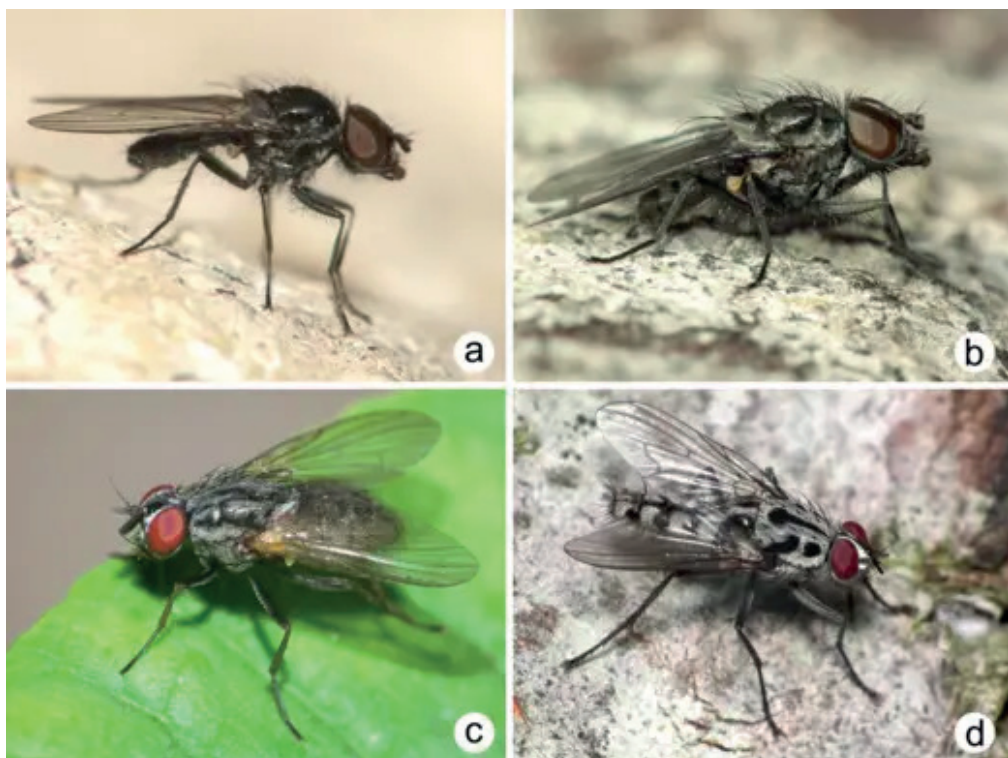


Fig. 8: Adult anthomyiids: a) *Egle parva* Robineau-Desvoidy (♂); b) *Egle rhinotmeta* (Pandellé) (♂); c) *Emmesomyia socia* (Fallén) (♀); d) *Eustalomyia hiliaris* (Fallén) (♂).

***Eustalomyia hiliaris* (Fallén, 1823) (Fig. 8d)**

1♂, [PT.GU-04], 19.vii.2008, identified from a photo taken by RA; 1♂, [PT.PO-10], 17.v.2010, identified from a photo taken by RA; 1♂, [PT.PO-04], reared from an egg deposited by a female collected on this day, 27.vii.2010, leg. RA; 1♂, [PT.AV-02], 12.viii.2010, identified from a photo taken by RA; 1♀, [PT.SA-07], SW, 28.vii.2013, leg. AG; 1♂, [PT.FA-01], SW, 30.ix.2016, leg. RA; 1♂, [PT.AV-02], 23.viii.2017, identified from a photo taken by RA.

Distribution: Widely distributed across the Palaearctic region. First record from Portugal.

***Eustalomyia histrio* (Zetterstedt, 1838)**

1♂, [PT.VC-01], SW, 25.vii.2013, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from Portugal.

***Fucellia* Robineau-Desvoidy, 1841**

In Europe, six species of *Fucellia* are known (Michelsen, 2013).

Two species have so far been found in Portugal: *F. maritima* (Haliday) and *F. tergina* (Zetterstedt).

F. maritima was first recorded for Portugal based on a single female specimen seen by Lyneborg in the Zoological Museum in Berlin (Lyneborg, 1965). This record was not mentioned either in the Catalogue of Palaearctic Diptera, in the catalogue of the Iberian Diptera, or in Fauna Europaea (Dely-Draskovits, 1993; Michelsen, 2013; Michelsen & Báez, 2002). More recently, Lourenço *et al.* (2020) published new records of a population of this species on a beach near Aveiro, confirming its presence in Portugal.

Fucellia species occur on sea shores worldwide, but can also be found along the margins of lakes and rivers.

Typical for *Fucellia* species is that male and female both have a broad vitta, small, rounded eyes and very small calypters. On sunny days, they can be more easily observed on beaches, owing to their silvery reflective appearance.

Fucellia larvae develop in seaweed stranded on beaches. Adults are attracted to decaying fish and crabs and other types of organic matter (Hennig, 1966-1976).

***Fucellia maritima* (Haliday, 1838) (Figs. 9a; 18)**

3♂1♀, [PT.PO-16], SW, 28.x.2011, leg. RA; 3♂♂3♀♀, [PT.BR-05], SW, 26.xii.2012, leg. RA; 2♂♂2♀♀, [PT.PO-16], SW, 12.xi.2013, leg. RA; 1♂2♀♀, [PT.PO-14], SW, 30.x.2016, leg. RA; 1♂, [PT.PO-14], SW, 17.i.2017, leg. RA; 1♂, [PT.BR-07], SW, 16.vi.2017, leg. RA; 3♂♂, [PT.BR-05], SW, 27.xi.2017, leg. RA; 1♂, [PT.BR-07], SW, 11.ix.2018, leg. RA; 1♂, [PT.VC-10], SW, 23.iii.2019, leg. RA; 1♂, [PT.BR-07], SW, 13.vi.2019, leg. RA.

Distribution: Known from the seashores of Western Europe and northwestern Africa. It has also been recorded in South Africa, where it was probably introduced (Kirk-Spriggs *et al.*, 2001).

***Fucellia tergina* (Zetterstedt, 1845)**

1♂, [PT.BR-07], SW, 13.vi.2019, leg. RA.

Distribution: Almost cosmopolitan, known from the Afrotropical, Australian, Nearctic, Neotropical and Palaearctic regions.

***Heterostylodes* Hennig, 1967**

In Europe, seven species of *Heterostylodes* are known (Michelsen, 2013).

In Portugal no records had been made of any *Heterostylodes* species, until now. One species has now been recorded: *H. nominabilis* (Collin).

Most species of *Heterostylodes* are small dark flies, 2-4 mm in length, and therefore can be easily overlooked in the field. Also, due to the sometimes strong similarities in genitalia and general appearance, they may be difficult to identify (Van Erkelens *et al.*, 2021).

Heterostylodes larvae are associated with plants of the Asteraceae family (Fig. 1f). In the case of *H. nominabilis*, the larvae live in flowerheads of *Pilosella officinarum* (Hennig, 1966-1976).

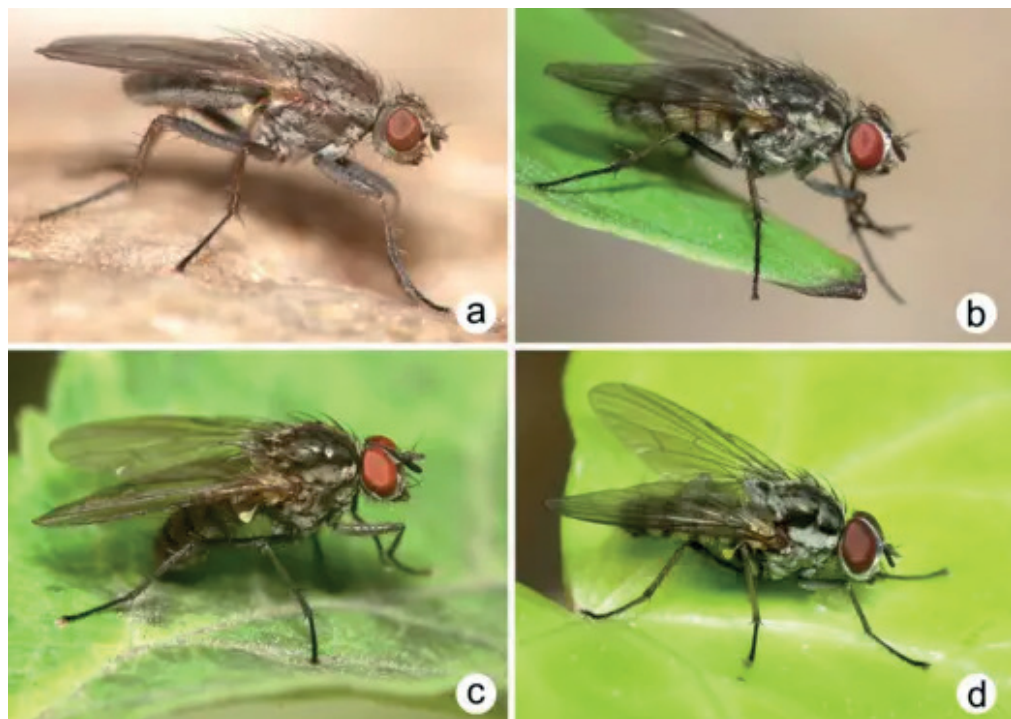


Fig. 9: Adult anthomyiids: a) *Fucellia maritima* (Haliday) (♀); b) *Hydrophoria ruralis* (Meigen) (♀); c) *Hylemya urbica* Van der Wulp (♂); d) *Hylemya vagans* (Panzer) (♂).

***Heterostylodes nominabilis* (Collin, 1947) (Fig. 19)**

1♂, [PT.BA-10], SW, 15.vii.2010, leg. RA.

Distribution: Widespread in Europe. First record from Portugal.

***Hydrophoria* Robineau-Desvoidy, 1830**

In Europe, seven species of *Hydrophoria* are known (Michelsen, 2013).

In Portugal no records had been made of any *Hydrophoria* species, until now. One species has now been recorded: *H. ruralis* (Meigen).

In general, *Hydrophoria* species are very common throughout Europe. They are relatively large flies (6-10 mm in length). They can be spotted almost everywhere, from small gardens in large city centres to dense forests. Therefore it is puzzling that, besides our own first record of *H. ruralis*, no other common European species from this genus have been found.

Despite most *Hydrophoria* species being very common, there is still almost nothing known about the biology of the larvae (Hennig, 1966-1976).

***Hydrophoria ruralis* (Meigen, 1826) (Fig. 9b)**

1♂, [PT.VC-09], SW, 25.vii.2013, SW, leg. RA; 1♂, [PT.BA-07], SW, 9.ix.2014, leg. RA; 1♂1♀, [PT.AV-02], SW, 18.vii.2016, leg. RA.

Distribution: Widely distributed throughout the Palaearctic region. First record from Portugal.

***Hylemya* Robineau-Desvoidy, 1830**

In Europe, five species of *Hylemya* are known (Michelsen, 2013).

In Portugal two species have been recorded so far (*Hylemya urbica* Van der Wulp and *Hylemya vagans* (Panzer)); two new species can be added to the list: *H. nigrimana* (Meigen) and *H. variata* (Fallén).

Most species of the genus *Hylemya* are very common throughout Europe.

The flies resemble *Hydrophoria* species in their general appearance and habitat preferences, and can therefore be confused with them, but in general they are smaller (4-7 mm).

As far as is known, *Hylemya* species are coprophagous or saprophagous. Several species have been reared from cow dung, but other types of dung were also used (Ferraz, 1987). *H. urbica* was reared from a fungus, but according to Chandler (2010) this record requires confirmation.

***Hylemya nigrimana* (Meigen, 1826)**

1♂, [PT.VC-08], SW, 6.viii.2020, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from Portugal.

***Hylemya urbica* Van der Wulp, 1896 (Fig. 9c)**

1♂, [PT.PO-10], SW, 28.vii.2010, leg. RA; 1♂1♀, [PT.CO-01], SW, 10.vii.2013, leg. AG; 1♂, [PT.PO-17], SW, 3.v.2014, leg. RA; 1♀, [PT.BA-25], SW, 18.vi.2015, leg. RA; 1♂, [PT.BA-20], SW, 3.vi.2016, leg. RA; 1♀, [PT.PO-10], SW, 21.vi.2016, leg. RA; 1♀, [PT.VR-05], SW, 23.v.2017, leg. RA; 1♂1♀, [PT.PO-11], SW, 21.vii.2017, leg. RA; 1♀, [PT.AV-01], SW, 16.xi.2018, leg. RA; 2♂♂, [PT.BE-09], SW, 8.iv.2021, leg. RA; 1♂, [PT.BE-04], SW, 9.iv.2021, leg. RA; 1♂, [PT.VR-04], SW, 3.v.2021, leg. RA.

Distribution: Widely distributed throughout the Holarctic and Oriental regions.

***Hylemya vagans* (Panzer, 1798) (Fig. 9d)**

1♂, [PT.PO-17], SW, 4.ii.2013, leg. RA; 1♂, [PT.SA-08], SW, 17.v.2013, leg. AG; 1♂, [PT.SA-08], SW, 18.v.2013, leg. AG; 1♀, [PT.PO-17], SW, 29.iii.2014, leg. RA; 1♂1♀, [PT.BA-25], SW, 18.vi.2015, leg. RA; 1♀, [PT.BA-27], SW, 21.vi.2015, leg. RA; 1♂, [PT.AV-02], SW, 13.iii.2016, leg. RA; 1♀, [PT.VC-07], SW, 30.v.2016, leg. RA; 1♀, [PT.BA-27], SW, 6.vi.2016, leg. RA; 1♂, [PT.AV-01], SW, 22.ii.2017, leg. RA; 1♂, [PT.BR-02], SW, 23.iv.2017, leg. RA; 1♀, [PT.AV-01], SW, 28.vii.2017, leg. RA; 1♂, [PT.AV-01], SW, 1.x.2017, leg. RA; 1♂, [PT.AV-01], SW, 21.xi.2017, leg. RA; 2♂♂, [PT.AV-01], SW, 21.ii.2018, leg. RA; 5♂♂1♀, [PT.AV-01], SW, 26.iii.2018, leg. RA; 1♀, [PT.BA-07], SW, 17.v.2018, leg. RA; 1♂, [PT.BA-23], SW, 18.v.2018, leg. RA; 1♂, [PT.BA-12], SW, 25.vii.2018, leg. RA; 1♀, [PT.BA-08], SW, 25.vii.2018, leg. RA; 1♂, [PT.PO-11], SW, 9.x.2018, leg. RA; 1♀, [PT.AV-01], SW, 16.xi.2018, leg. RA; 1♂, [PT.AV-01], SW, 25.i.2019, leg. RA; 1♂, [PT.BR-02], SW, 30.iv.2019, leg. RA; 1♀, [PT.AV-01], SW, 5.xii.2019, leg. RA; 1♂, [PT.VC-08], SW, 6.viii.2020, leg. RA.

Distribution: Widespread in the Palaearctic region and Near East.

***Hylemya variata* (Fallén, 1823) (Fig. 10a)**

1♀, [PT.GU-02], 29.vii.2014, leg. AG; 1♀, [PT.CB-03], SW, 2.ix.2014, leg. AG; 1♂, [PT.BA-13], SW, 3.x.2015, leg. RA; 1♀, [PT.VR-01], SW, 30.iv.2016, leg. RA; 1♂3♀, [PT.VC-03], SW, 9.ix.2016, leg. RA; 1♂2♀, [PT.VC-05], SW, 10.ix.2016, leg. RA; 1♀, [PT.AV-01], SW, 26.iii.2018, leg. RA; 1♀, [PT.BA-07], SW, 17.v.2018, leg. RA; 1♂, [PT.BA-10], SW, 25.vii.2018, leg. RA; 2♂♂1♀, [PT.BA-08], SW, 25.vii.2018, leg. RA; 2♂♂, [PT.VR-01], SW, 19.v.2020, leg. RA; 1♂1♀, [PT.VI-02], SW, 5.vi.2020, leg. RA; 1♂, [PT.VI-01], SW, 5.vi.2020, leg. RA.

Distribution: Widespread in Europe and Near East. First record from Portugal.

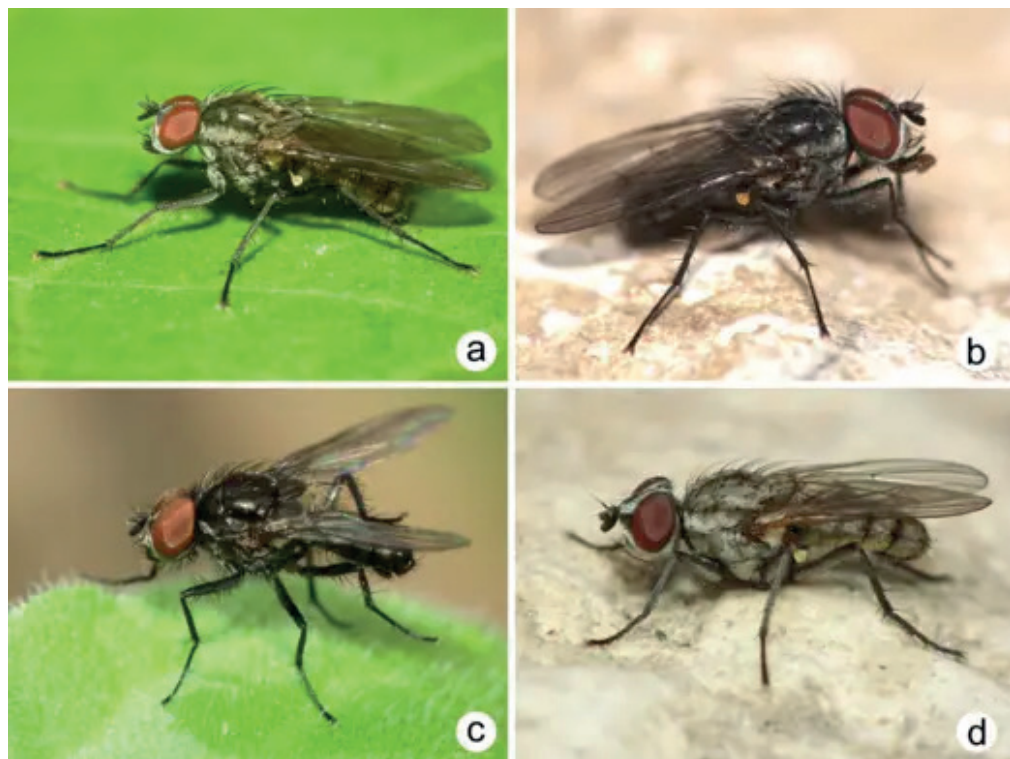


Fig. 10: Adult anthomyiids: a) *Hylemya variata* (Fallén) (♂); b) *Lasiomma seminitidum* (Zetterstedt) (♂); c) *Lasiomma strigilatum* (Zetterstedt) (♂); d) *Leucophora brevifrons* (Stein) (♂).

***Lasiomma* Stein, 1916**

In Europe, 18 species of *Lasiomma* are known (Michelsen, 2013). Two species have been recorded for Portugal: *L. seminitidum* (Zetterstedt) and *L. strigilatum* (Zetterstedt).

Lasiomma species are inconspicuous, dark-coloured flies and their flight periods can last from early spring until late in the year in central Europe, although at least *L. seminitidum* appears to be active year-round in Portugal. Some of the species have conspicuously hairy eyes (which is also the case in *L. seminitidum* and *L. strigilatum*), which do not occur in other genera of Anthomyiidae, although some have microscopic hairs.

Lasiomma species are saprophagous; larvae can be found associated with a wide array of potential food sources, from nests of *Thaumetopoea processionea* and in regurgitated pellets of owls (Zeegers, 2006). The second author has previously reared them out of droppings from swallows (Van Erkelens, 2012). There are also observations where larvae were reared from birds' nests, faeces of humans and other mammals, as well as dead snails (Ferrari, 1987; Hennig, 1966-1976).

***Lasiomma seminitidum* (Zetterstedt, 1845) (Fig. 10b)**

4♂♂, [PT.PO-10], SW, collected while swarming under *Quercus suber* branches, 23.ii.2011, leg. RA; 2♂♂1♀, [PT.PO-10], SW, 19.xii.2011, leg. RA; 1♂, [PT.PO-10], SW, 26.iii.2012, leg. RA; 2♂♂, [PT.PO-10], SW, 4.i.2013, leg. RA; 2♂♂1♀, [PT.PO-17], SW, 9.ii.2013, leg. RA; 2♂♂, [PT.PO-10], SW, 31.v.2013, leg. RA; 1♀, [PT.CB-01], SW, 12.iv.2014, leg. RA; 1♂, [PT.PO-10], SW, 26.i.2015, leg. RA; 1♂, [PT.PO-04], HC, 5.xii.2016, leg. RA; 1♂, [PT.BR-02], SW, 12.iii.2019, leg. RA; 1♀, [PT.BR-02], SW, 5.iv.2019, leg. RA; 1♀, [PT.VI-02], SW, 5.vi.2020, leg. RA.

Distribution: Distributed across the Palearctic region.

***Lasiomma strigilatum* (Zetterstedt, 1838) (Fig. 10c)**

1♂, [PT.VR-04], SW, 19.v.2020, leg. RA.

Distribution: Widespread in the Palearctic region.

***Leucophora* Robineau-Desvoidy, 1830**

In Europe, 19 species of *Leucophora* are known (Michelsen, 2013).

For Portugal, one species had so far been recorded, *L. cinerea* (Robineau-Desvoidy), and five new species are now added to the list: *L. brevifrons* (Stein), *L. dissimilis* (Villeneuve), *L. personata* (Collin), *L. subsponsa* (Michelsen in Michelsen & Báez) and *L. unistriata* (Zetterstedt).

All *Leucophora* species are nest parasites of several Hymenoptera species, with a preference for ground-nesting bees (Anthophila) and, more rarely, also attacking solitary wasps of the family Crabronidae. The adults can be seen in early spring, when several wasps and bees are already active; *Leucophora* species pursue them to their nest entrance, where they lay their eggs. Many species of *Leucophora* have broad and silver-coloured gena and parafacial and can therefore be recognizable from a great distance due to reflected sunlight. In general, they are compact flies that have their wings lying flat over the abdomen. Differences between male and female are in most cases difficult to see (especially in photos), because both sexes usually have an evenly broad abdomen, frontal vitta and gena and therefore can look very similar. Identification under a microscope is needed. The length can vary from 2-13 mm (Hennig, 1966-1976; Loonstra & Van Erkelens, 2011).

The eggs are deposited in the nesting corridors or brood cells of Hymenoptera nests. The fly larvae feast on the hymenopteran's larva's food supply, which consists of pollen and nectar in the case of the solitary ground-nesting bees, and also on the prey of species of solitary wasps (Polidori *et al.*, 2005). Multiple larvae can develop within one brood cell (Knerer & Atwood, 1967).

***Leucophora brevifrons* (Stein, 1916) (Fig. 10d)**

1♂, [PT.PO-11], SW, 30.viii.2018, leg. RA.

Distribution: Known from only a few European countries, namely Austria, France, Italy and Switzerland. First record from the Iberian Peninsula.

Note: This species was only known from the Alps, so its presence in Portugal in a small mountainous area at low altitude is somewhat unexpected. Further research is needed to ascertain whether this species regularly occurs at low altitudes.

***Leucophora cinerea* Robineau-Desvoidy, 1830 (Fig. 11a)**

2♂♂, [PT.BR-02], SW, 21.v.2012, leg. RA; 1♂, [PT.BR-02], SW, 4.vi.2012, leg. RA; 1♂, [PT.LI-01], SW, 21.viii.2013, leg. RA; 1♂, [PT.BR-08], SW, 20.vi.2014, leg. RA; 1♂1♀, [PT.BR-02], SW, 21.vi.2014, leg. RA; 1♂, [PT.BR-02], SW, 14.v.2018, leg. RA; 1♂, [PT.BR-02], SW, 27.vi.2019, leg. RA.

Distribution: Widespread in the Holarctic region.

***Leucophora dissimilis* (Villeneuve, 1920)**

1♂, [PT.BA-16], SW, 16.v.2018, leg. RA.

Distribution: A mainly circum-Mediterranean species. First record from Portugal.

***Leucophora personata* (Collin, 1922) (Fig. 11b)**

1♂, [PT.PO-10], SW, 10.iii.2011, leg. RA; 2♂♂2♀♀, [PT.PO-10], SW, 26.iii.2012, leg. RA; 2♂♂, [PT.PO-10], SW, 13.iii.2013, leg. RA; 7♂♂1♀, [PT.PO-10], SW, 10.iii.2014, leg. RA; 1♀, [PT.BR-02], SW, 16.iv.2015, leg. RA; 1♀, [PT.BR-02], SW, 29.ii.2016, leg. RA; 1♀, [PT.PO-14], SW, 23.iii.2016, leg. RA; 1♂, [PT.BR-02], SW, 28.iii.2017,

leg. RA; 1♀, [PT.BR-02], SW, 15.iv.2018, leg. RA; 1♂, [PT.BR-02], SW, 10.iii.2019, leg. RA; 3♂♂, [PT.BR-02], SW, 14.iii.2019, leg. RA; 1♂, [PT.PO-02], SW, 27.iii.2021, leg. RA.

Distribution: Widespread in the Palearctic region. First record from Portugal.

***Leucophora subspensa* Michelsen in Michelsen & Báez, 1985 (Figs. 11c; 20)**

2♂♂1♀, [PT.PO-10], SW, 7.iii.2011, leg. RA; 1♂, [PT.PO-10], SW, 26.iii.2012, leg. RA; 1♂1♀, [PT.PO-10], SW, 9.iv.2012, leg. RA; 5♂♂, [PT.PO-10], SW, 13.iii.2013, leg. RA; 1♂, [PT.BE-01], SW, 15.iii.2015, leg. RA; 4♂♂4♀♀, [PT.PO-11], SW, 21.iii.2018, leg. RA; 1♀, [PT.PO-11], SW, 24.ii.2020, leg. RA.

Distribution: Known from the Balearic Islands, Canary Islands, Spanish mainland and North Africa. According to Michelsen & Báez (1985) the species is probably widely distributed in the Mediterranean subregion. First record from Portugal.

***Leucophora unistriata* (Zetterstedt, 1838) (Fig. 11d)**

1♂, [PT.PO-10], SW, 26.iv.2016, leg. RA; 1♂, [PT.VR-04], SW, 23.v.2017, leg. RA.

Distribution: Widespread in the Holarctic region. First record from Portugal.

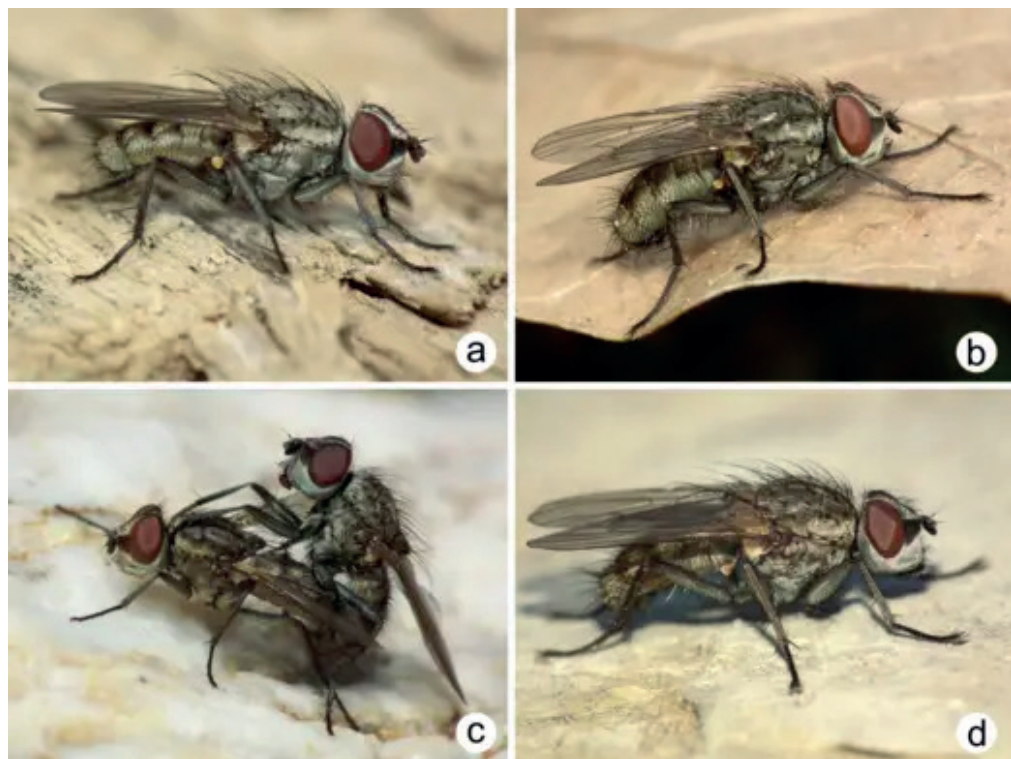


Fig. 11: Adult anthomyiids: a) *Leucophora cinerea* Robineau-Desvoidy (♂); b) *Leucophora personata* (Collin) (♂); c) *Leucophora subspensa* Michelsen (copula); d) *Leucophora unistriata* (Zetterstedt) (♂).

Mycophaga Rondani, 1856

Mycophaga is a monotypic genus represented by the species *M. testacea* (Gimmerthal), which is widely distributed throughout Europe (Michelsen, 2013). This species has now also been found in Portugal.

M. testacea is often mistaken with *Pegomya* species, because of external similarities. The legs are yellow in the male and the female, and the abdomen is also yellowish. Because of the relative long-haired arista in *M. testacea*, this species can be distinguished from species of the genus *Pegomya*, in which no species has a haired arista (Hennig, 1966-1976). Not much is known on the biology of the larvae, but they have been associated with mushrooms (Hennig, 1966-1976).

Mycophaga testacea (Gimmerthal, 1834) (Figs. 12a; 21)

1♂, [PT.PO-10], SW, 13.vi.2012, leg. RA; 2♂♂, [PT.PO-17], SW, 29.iii.2014, leg. RA; 1♀, [PT.PO-04], HC, 16.iii.2017, leg. RA; 2♂♂2♀♀, [PT.SA-03], SW, 13.vii.2020, leg. RA & AG; 1♀, [PT.GU-06], SW, 23.vii.2023, leg. RA (RA coll.).

Distribution: Widespread in the Palaearctic region. First record from Portugal.

Paradelia Ringdahl, 1933

In Europe, 28 species of *Paradelia* are known (Michelsen, 2013).

In Portugal no records had been made of any *Paradelia* species, until now. One species has now been found: *Paradelia intersecta* (Meigen).

Paradelia is well represented in the eastern parts of the Palaearctic Region and the northern, elevated parts of the Oriental Region. Species of this genus live inconspicuously in many types of habitats and are difficult for the naked eye to see due to their dark appearance.

P. intersecta is one of the more common species, and is widespread within Europe (Michelsen, 2007).

Although *P. intersecta* is a widespread and common species in Europe, little is known about the ecology of the larvae of the species. It is assumed that the larvae live on rotting plant remains (Michelsen, 2007).

Paradelia intersecta (Meigen, 1826)

1♂, [PT.BA-27], SW, 21.vi.2015, leg. RA; 1♂, [PT.BA-17], SW, 1.v.2016, leg. RA; 1♀, [PT.BR-02], SW, 16.iv.2018, leg. RA.

Distribution: Distributed throughout the Holarctic region. First record from Portugal.

Paregle Schnabl, 1911

In Europe, five species of *Paregle* are known (Michelsen, 2013). In Portugal no records had been made of any *Paregle* species, until now. One species has been found: *Paregle audacula* (Harris).

This genus consists for the most part of dark-coloured flies, most of which have a cryptic life history, occurring in different types of habitats, and are therefore barely perceptible to the naked eye. Their size is also small, ranging in length from 3-7 mm. *P. audacula* has the mouth margin strongly projecting (Hennig, 1966-1976).

Very little is known about the life history of larvae of this genus. *P. audacula* has been reared from different types of excrement such as dog, human, hedgehog or cow. It also feeds on the roots of plants such as cabbage, beans or radishes, among others (Ferrari, 1987; Hennig, 1966-1976).

Paregle audacula (Harris, 1780) (Fig. 12b)

1♂, [PT.BR-02], YPT, 28.i.2013, leg. RA; 1♂, [PT.BR-02], SW, 29.ii.2016, leg. RA; 1♀, [PT.PO-10], SW, 21.vi.2016, leg. RA; 1♀, [PT.BR-02], SW, 14.viii.2016, leg. RA; 1♂, [PT.PO-04], HC, 25.ii.2017, leg. RA; 1♂, [PT.BR-02], SW, 21.iv.2017, leg. RA; 1♂, [PT.BR-02], SW, 23.iv.2017, leg. RA; 3♀♀, [PT.BA-24], SW, 15.v.2018, leg. RA; 3♂♂, [PT.BR-02], SW, 20.v.2018, leg. RA; 2♂♂, [PT.BR-02], SW, 29.v.2019, leg. RA.

Distribution: Widely distributed across the Holarctic region. Also present in Australia. First record from mainland Portugal (also known from the Azores and Madeira archipelagos).

Pegomya Robineau-Desvoidy, 1830

In Europe, 79 species of *Pegomya* are known (Michelsen, 2013).

In Portugal six species had been found so far, three of which in mainland Portugal and another three in Madeira. A new species for mainland Portugal and five new species for the country can now be added to the list: *P. bicolor* (Wiedemann), *P. cunicularia* (Rondani), *P. flavifrons* (Walker), *P. fulgens* (Meigen), *P. solennis* (Meigen), and *P. winthemi* (Meigen).

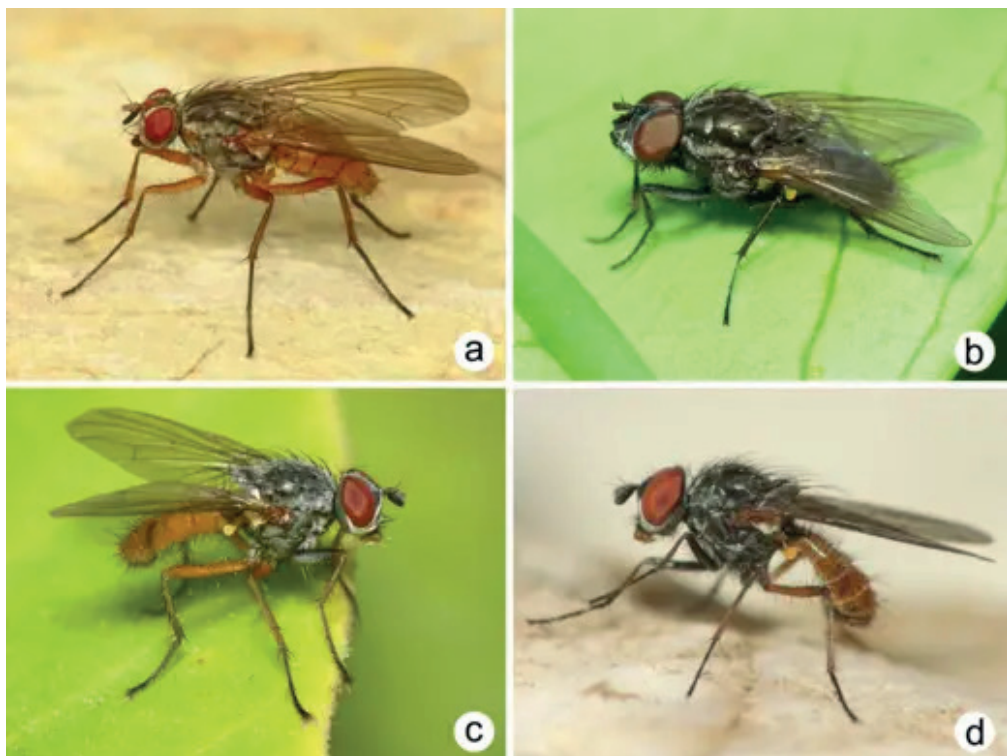


Fig. 12: Adult anthomyiids: a) *Mycophaga testacea* (Gimmerthal) (♀); b) *Paregle audacula* (Harris) (♂); c) *Pegomya bicolor* (Wiedemann) (♂); d) *Pegomya flavifrons* (Walker) (♂).

Species of this genus vary in length between 3-9 mm. Many of them have light-coloured legs (brown to orange), and some of them have also a light-coloured abdomen (brown to orange). However, dark coloured species have also been described. Species are difficult to diagnose because of the external and genital similarities between them. Most *Pegomya* live close to the ground, between grasses and other small plants.

The genus *Pegomya* is usually divided into three groups based on their ecology. In one major group of species the larvae mine in a wide range of plants (Fig. 1g), while in a second major group the larvae mine in a wide range of fungi (Fig. 1h). There is a very small third group in which the larvae mine in the shoots of spurges (*Euphorbia* spp.) (Ellis, 2007; Hennig, 1966-1976; Michelsen, 1988). The group of plant-mining species is represented in mainland Portugal by the species *P. bicolor*, *P. cunicularia*, *P. flavifrons* and *P. solennis*, while the group of species that mine fungi is represented in mainland Portugal by the species *P. fulgens*, *P. rufina*, *P. testacea*, *P. ulmaria* and *P. winthemi*. Species belonging to the third group have not yet been detected in Portugal.

***Pegomya bicolor* (Wiedemann, 1817) (Figs. 1g; 12c)**

1♂, [PT.PO-10], SW, 31.v.2012, leg. RA; 1♀, [PT.PO-10], SW, 26.iv.2016, leg. RA; 1♂, [PT.PO-04], HC, 20.iii.2017, leg. RA; 1♀, [PT.BA-24], SW, 15.v.2018, leg. RA; 1♂, [PT.BE-06], SW, 8.iv.2021, leg. RA.

Distribution: Widespread in the Holarctic region. First record from mainland Portugal (also known from Madeira Island).

***Pegomya cunicularia* (Rondani, 1866)**

1♂, [PT.CO-03], SW, 18.x.2014, leg. AG.

Distribution: Widespread in the Palearctic region. First record from the Iberian Peninsula.

***Pegomya flavifrons* (Walker, 1849) (Figs. 12d; 22)**

1♂, [PT.BR-02], SW, 16.iv.2012, leg. RA; 1♂, [PT.BR-03], MT, 21.v – 4.vi.2012, leg. RA; 1♂, [PT.BA-09], SW, 20.vi.2015, leg. RA; 1♂, [PT.BR-02], SW, 27.iii.2017, leg. RA; 1♂, [PT.BR-02], SW, 22.iv.2019, leg. RA; 1♂, [PT.BR-02], SW, 11.v.2019, leg. RA.

Distribution: Widespread in the Holarctic region. First record from Portugal.

***Pegomya fulgens* (Meigen, 1826)**

1♂, [PT.BA-06], SW, 19.vi.2015, leg. RA; 1♂, [PT.BA-27], SW, 21.vi.2015, leg. RA.

Distribution: Widespread in Europe. Presence in East Asia is doubtful. First record from Portugal.

***Pegomya rufina* (Fallén, 1825)**

1♂, [PT.PO-10], SW, 31.v.2012, leg. RA; 1♂, [PT.BA-27], SW, 6.vi.2016, leg. RA; 1♂, [PT.VR-05], SW, 23.v.2017, leg. RA.

Distribution: Widespread in the Palaearctic region.

***Pegomya solennis* (Meigen, 1826)**

1♀, [PT.VI-04], SW, 26.iv.2014, leg. RA; 1♂, [PT.BA-26], SW, 4.x.2015, leg. RA; 1♂, [PT.BA-27], SW, 6.vi.2016, leg. RA; 1♂, [PT.BR-02], SW, 5.iv.2019, leg. RA; 1♂, [PT.BE-06], SW, 7.iv.2021, leg. RA; 1♀, [PT.BE-09], SW, 8.iv.2021, leg. RA.

Distribution: Widely distributed across the Holarctic region. First record from the Iberian Peninsula.

***Pegomya testacea* (De Geer, 1776) (Fig. 13a)**

1♀, [PT.GU-04], SW, 22.ix.2013, leg. RA; 1♂, [PT.BA-21], SW, 10.vi.2023, leg. RA (RA coll.).

Distribution: Distributed throughout Europe and Near East. Presence in North Africa is doubtful.

***Pegomya ulmaria* (Rondani, 1866) (Fig. 13b)**

1♂, [PT.SA-01], SW, 29.iii.2011, leg. RA; 1♂, [PT.BR-04], SW, 25.vi.2013, leg. RA; 1♂, [PT.AV-02], SW, 6.viii.2013, leg. RA; 3♂♂, [PT.VI-03], SW, 27.iv.2014, leg. RA; 1♂, [PT.PO-04], HC, 17.ii.2017, leg. RA; 1♂, [PT.AV-01], SW, 26.iii.2018, leg. RA; 3♂♂1♀, [PT.BA-12], SW, 25.vii.2018, leg. RA; 1♂, [PT.SA-06], SW, 11.vii.2020, leg. RA & AG; 1♀, [PT.SA-06], SW, 12.vii.2020, leg. AG; 4♂♂, [PT.BE-07], SW, 8.iv.2021, leg. RA.

Distribution: Widespread in the Palaearctic region.

***Pegomya winthemi* (Meigen, 1826) (Figs. 1h; 13c)**

2♀♀, [PT.BA-22], SW, 6.x.2015, leg. RA; 1♀, [PT.PO-10], SW, 21.vi.2016, leg. RA; 1♀, [PT.VC-04], SW, 9.ix.2016, leg. RA; 1♀, [PT.VR-02], SW, 23.ix.2016, leg. RA; 2♀♀, [PT.PO-10], SW, 9.x.2016, leg. RA; 1♂1♀, [PT.PO-11], SW, 6.x.2017, leg. RA; 2♀♀, [PT.VC-08], SW, 6.viii.2020, leg. RA.

Distribution: Widespread in the Holarctic region. First record from Portugal.

***Pegoplata* Schnabl & Dziedzicki, 1911**

In Europe, 10 species of *Pegoplata* are known (Michelsen, 2013).

In Portugal no records had been made of any *Pegoplata* species, until now. One species has now been found: *Pegoplata infirma* (Meigen).

This genus consists for the most part of dark-coloured flies, most of which have a cryptic natural history in different types of habitats, and are therefore barely perceptible to the naked eye. They vary in length from 2-7 mm. Some of the species in this genus have strongly enlarged palps, and some of them also can have long haired arista. *P. infirma* is one of the smallest species (2-4 mm) (Hennig, 1966-1976).

Little is known about the ecology of larvae of this genus. *P. aestiva* develops in cow dung, while *P. infirma* larvae have been found on brassicas and feeding on freshly-sown maize seeds (Hennig, 1966-1976).

***Pegoplata infirma* (Meigen, 1826)**

1♀, [PT.CB-01], SW, 12.iv.2014, leg. RA; 1♀, [PT.BA-01], SW, 2.vi.2016, leg. RA; 1♀, [PT.VC-03], SW, 9.ix.2016, leg. RA; 1♂1♀, [PT.VC-08], SW, 6.viii.2020, leg. RA.

Distribution: Widespread in the Holarctic region. First record from Portugal.

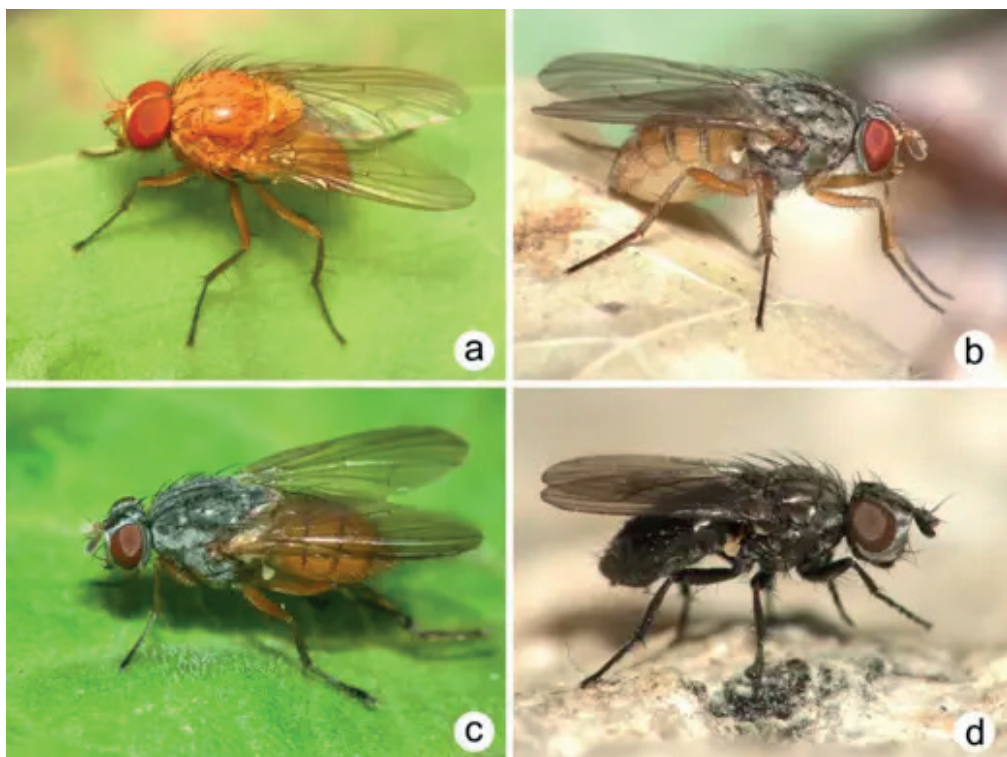


Fig. 13: Adult anthomyiids: a) *Pegomya testacea* (De Geer) (♂); b) *Pegomya ulmaria* (Rondani) (♀); c) *Pegomya winthemi* (Meigen) (♀); d) *Phorbia melania* Ackland & Michelsen (♂).

***Phorbia* Robineau-Desvoidy, 1830**

In Europe, 26 species of *Phorbia* are known (Michelsen, 2013).

In Portugal no records had been made of any *Phorbia* species, until now. Three species are now added to the list: *Phorbia fumigata* (Meigen), *Phorbia melania* (Ackland & Michelsen) and *Phorbia moliniaris* (Karl).

Phorbia species are miners on various grasses, plants and young sprouts of cereals, and some of them can be agricultural pests (Dušek, 1970). They live hidden among grasses in different biotopes, making them difficult to observe.

Typical for the species of *Phorbia* is that the face is somewhat retreating, so that the parafrontal angle is much more prominent than the peristomal margin (Ackland, 1997; Hennig, 1966-1976).

The larvae of *Phorbia* species live as miners on various grasses, eating their way into both the stem and parts of the plant's leaf. The female has a hardened and slightly crooked end of the ovipositor, with which a cut is made in a stem of a plant, so that when the larva crawls out of the egg, it has direct access to the interior of the stem (Ellis, 2007).

***Phorbia fumigata* (Meigen, 1826)**

1♂, [PT.SA-02], SW, 30.iii.2011, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from Portugal.

***Phorbia melania* Ackland & Michelsen, 1987 (Figs. 13d; 23)**

1♂2♀♀, [PT.BA-04], SW, 27.iv.2011, leg. RA.

Distribution: Widespread in the Palaearctic region. First record from the Iberian Peninsula.

***Phorbia moliniaris* (Karl, 1917) (Fig. 14a)**

1♂, [PT.PO-10], SW, 29.ii.2012, leg. RA; 2♂♂2♀♀, [PT.PO-10], SW, 10.iii.2014, leg. RA; 1♂, [PT.PO-11], SW, 24.ii.2020, leg. RA.

Distribution: Widespread in Europe. First record from the Iberian Peninsula.

***Subhylemyia* Ringdahl, 1933**

In Europe, only one species of *Subhylemyia* is known (Michelsen, 2013). *Subhylemyia longula* (Fallén) had already been recorded for Portugal.

S. longula is common throughout Europe and can vary considerably in length (3–7 mm). Under certain light conditions, it can be seen that the crossveins of the wings are somewhat infuscated (Hennig, 1966–1976).

Larvae live on dead snails (Hennig, 1966–1976).

***Subhylemyia longula* (Fallén, 1824) (Fig. 14b)**

1♂, [PT.GU-05], SW, 29.vi.2013, leg. AG; 2♂♂, [PT.CB-01], SW, 12.iv.2014, leg. RA; 1♂, [PT.CB-01], SW, 13.iv.2014, leg. AG; 1♀, [PT.GU-03], SW, 28.vii.2014, leg. AG; 1♀, [PT.GU-02], 29.vii.2014, leg. AG; 2♂♂1♀, [PT.CB-03], SW, 2.ix.2014, leg. AG; 2♀♀, [PT.GU-09], SW, 5.ix.2014, leg. AG; 1♂, [PT.BE-12], SW, 16.xi.2014, leg. RA; 1♂1♀, [PT.BA-08], SW, 20.vi.2015, leg. RA; 1♀, [PT.BR-02], SW, 19.xii.2015, leg. RA; 1♀, [PT.PO-10], SW, 21.vi.2016, leg. RA; 1♂, [PT.VC-04], SW, 9.ix.2016, leg. RA; 1♂, [PT.BR-02], SW, 16.iv.2018, leg. RA; 1♂3♀♀, [PT.BR-07], SW, 17.iv.2018, leg. RA; 2♂♂, [PT.BA-20], SW, 16.v.2018, leg. RA; 9♂♂3♀♀, [PT.BA-10], SW, 25.vii.2018, leg. RA; 1♀, [PT.BA-08], SW, 25.vii.2018, leg. RA; 2♀♀, [PT.BA-10], SW, 19.vii.2020, leg. RA; 1♂, [PT.BA-15], SW, 19.vii.2020, leg. RA; 1♀, [PT.VC-08], SW, 6.viii.2020, leg. RA.

Distribution: Present in the Holarctic and Oriental regions.

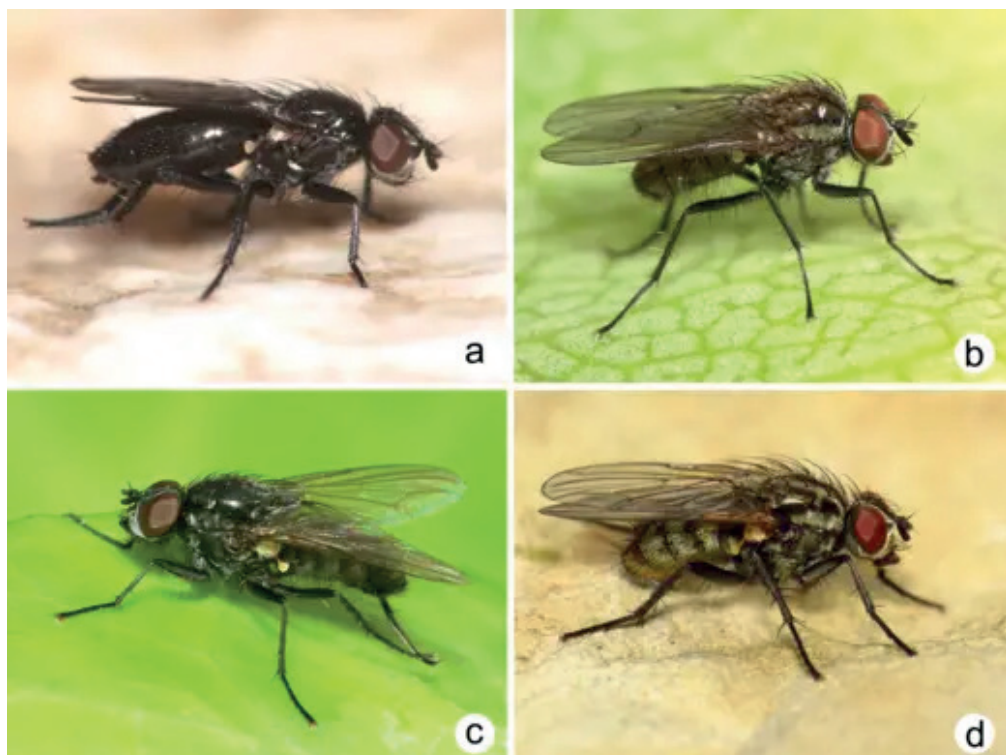


Fig. 14: Adult anthomyiids: a) *Phorbia moliniaris* (Karl) (♀); b) *Subhylemyia longula* (Fallén) (♂); c) *Zaphne divisa* (Meigen) (♂); d) *Zaphne inuncta* (Zetterstedt) (♀).

***Zaphne* Robineau-Desvoidy, 1830**

In Europe, 19 species are known from the genus *Zaphne* (Michelsen, 2013).

In Portugal no records had been made of any *Zaphne* species, until now. Two species can be added to the list: *Z. divisa* (Meigen) and *Z. inuncta* (Zetterstedt).

Zaphne species can vary in length (3-8 mm), some of them are black and shiny, while others have a more greyish, brown or yellowish appearance. Typical for *Zaphne* species is that the mentum of the proboscis is shining black. Some of the species have long specialised setae and setulae on the sternites and tergites (Ackland, 1997).

Not much is known of the biology of the larvae. Larvae of *Z. inuncta* have been found in owl pellets, while larvae of *Z. lineatocollis* have been reared from cocoons of sawflies (Hennig, 1966-1976). There are observations of adult specimens preying on small midges from the family Chironomidae, and some species prefer humid environments (Griffiths, 1998).

***Zaphne divisa* (Meigen, 1826) (Fig. 14c)**

1♂, [PT.AV-01], SW, 24.x.2018, leg. RA; 1♂, [PT.BA-15], SW, 19.vii.2020, leg. RA.

Distribution: Distributed throughout the Holarctic region. First record from the Iberian Peninsula.

***Zaphne inuncta* (Zetterstedt, 1838) (Figs. 14d; 24)**

1♂, [PT.PO-10], SW, 27.viii.2011, leg. RA; 1♂, [PT.AV-02], SW, 2.vi.2014, leg. RA; 1♂, [PT.AV-03], SW, 2.vi.2014, leg. RA; 1♀, [PT.BA-07], SW, 8.viii.2014, leg. RA; 1♂, [PT.AV-02], SW, 28.vi.2016, leg. RA; 1♀, [PT.AV-02], SW, 18.vii.2016, leg. RA; 1♀, [PT.AV-03], SW, 23.i.2017, leg. RA; 1♀, [PT.AV-02], SW, 12.vii.2017, leg. RA; 2♀♀, [PT.AV-02], SW, 23.viii.2017, leg. RA; 1♂, [PT.PO-11], SW, 21.iii.2018, leg. RA; 1♂, [PT.AV-02], SW, 24.ix.2018, leg. RA.

Distribution: Widespread in the Palearctic region. First record from Portugal.

Doubtful species

Within Anthomyiidae, reliable identification of the species is mainly achieved through microscopic examination of the male genitalia. Species identification is, nonetheless, sometimes hampered by the great similarity between the males' genitalia of some species; in these cases a combination of external and genital characteristics may be necessary to reach a confident identification. Females, on the other hand, are usually too similar to each other with regard to their external morphology for a confident identification to be achieved, and research into differences in the ovipositor between species is still at a very early stage. In many cases, due to these difficulties, it was not possible to identify the females, and this material was therefore excluded from the results.

Some doubtful cases, however, are presented here as they may represent new species for the country, but for different reasons it was not possible to reach a safe identification. Below each of these cases the reason for the doubts is explained.

***Botanophila* cf. *laterella* (Collin, 1967) (Fig. 5c)**

1♂, [PT.PO-10], SW, 9.iv.2012, leg. RA.

Remarks: Unfortunately, the genitalia was lost during preparation, therefore its identity remains uncertain.

***Delia* cf. *floricola* Robineau-Desvoidy, 1830**

1♂, [PT.BA-10], SW, 19.vii.2020, leg. RA.

Remarks: The genitalia of male *Delia* are often very similar to each other, and the best way to achieve a confident identification is to have access to reference material for all the species with which it could be confused and thus compare and make a decision. Without having access to this reference material, we chose to leave the identification of this specimen as uncertain.

***Lasiomma cf. anthomyinum* (Rondani, 1866)**

1♀, [PT.BA-03], SW, 31.v.2016, leg. RA; 1♀, [PT.BR-02], SW, 4.v.2019, leg. RA.

Remarks: These females were collected without accompanying males, and for this reason it was not possible to reach a safe identification. They may, however, belong to the species *Lasiomma anthomyinum* (Rondani, 1866).

***Lasiomma cf. picipes* (Meigen, 1826)**

1♀, [PT.FA-04], SW, 2.x.2016, leg. RA.

Remarks: This female may belong to the species *Lasiomma picipes* (Meigen, 1826), but it will be necessary to collect males to confirm the identification.

***Leucophora* sp.**

2♂♂, [PT.PO-02], SW, 27.iii.2021, leg. RA.

Remarks: These two specimens have similarities with both *L. unistriata* (Zetterstedt) and *L. sericea* Robineau-Desvoidy, but a confident identification could not be achieved; thus, they were assigned to *Leucophora* sp. It is our intention to follow-up on the identification of these two specimens by seeking the opinion of other Anthomyiidae researchers.

***Pegomya cf. deprimata* (Zetterstedt, 1845)**

1♀, [PT.VC-03], SW, 9.ix.2016, leg. RA.

Remarks: This female may belong to the species *Pegomya deprimata* (Zetterstedt, 1845), but males are needed to confirm this.

***Pegomya cf. dulcamarae* Wood, 1913**

1♀, [PT.BE-09], SW, 8.iv.2021, leg. RA.

Remarks: Without accompanying males, it was not possible to confirm the identity of this female.

Pegomya circumpolaris/furva

1♀, [PT.BR-07], SW, 17.iv.2018, leg. RA.

Remarks: This female collected without accompanying males is not identifiable to species and could belong to either *P. circumpolaris* Ackland & Griffiths, 1983 or to *P. furva* Ringdahl, 1938.

Updated checklist of the Anthomyiidae of mainland Portugal

(nIB: new for Iberian fauna; nP: new for Portuguese fauna; nPm: new for the Portuguese mainland fauna)

Species	nIB	nP	nPm
<i>Adia cinerella</i> (Fallén, 1825)			
<i>Anthomyia confusanea</i> Michelsen in Michelsen & Báez, 1985			
<i>Anthomyia imbrida</i> Rondani, 1866			
<i>Anthomyia liturata</i> (Robineau-Desvoidy, 1830)		X	
<i>Anthomyia monilis</i> (Meigen, 1826)		X	
<i>Anthomyia phuvialis</i> (Linnaeus, 1758)			
<i>Anthomyia procellaris</i> Rondani, 1866			
<i>Anthomyia quinquemaculata</i> Macquart, 1839			
<i>Botanophila brunneilinea</i> (Zetterstedt, 1845)		X	
<i>Botanophila fugax</i> (Meigen, 1826)		X	
<i>Botanophila lobata</i> (Collin, 1967)		X	

<i>Botanophila striolata</i> (Fallén, 1824)		X	
<i>Calythea nigricans</i> (Robineau-Desvoidy, 1830)		X	
<i>Chirosia albitarsis</i> (Zetterstedt, 1845)		X	
<i>Chirosia betuleti</i> (Ringdahl, 1935)		X	
<i>Chirosia flavipennis</i> (Fallén, 1823)		X	
<i>Chirosia griseifrons</i> (Séguy, 1923)	X		
<i>Chirosia grossicauda</i> Strobl, 1899		X	
<i>Chirosia histricina</i> (Rondani, 1866)		X	
<i>Delia antiqua</i> (Meigen, 1826)		X	
<i>Delia bracata</i> (Rondani, 1866)			
<i>Delia brunnescens</i> (Zetterstedt, 1845)		X	
<i>Delia cardui</i> (Meigen, 1826)		X	
<i>Delia coronariae</i> (Hendel, 1925)	X		
<i>Delia criniventris</i> (Zetterstedt, 1860)	X		
<i>Delia echinata</i> (Séguy, 1923)			X
<i>Delia hirticrura</i> (Rondani, 1871)	X		
<i>Delia penicillosa</i> Hennig, 1974		X	
<i>Delia pilifemur</i> (Ringdahl, 1933)	X		
<i>Delia planipalpis</i> (Stein, 1898)		X	
<i>Delia platura</i> (Meigen, 1826)			
<i>Delia quadripila</i> (Stein, 1916)	X		
<i>Delia radicum</i> (Linnaeus, 1758)			
<i>Egle ciliata</i> (Walker, 1849)		X	
<i>Egle minuta</i> (Meigen, 1826)		X	
<i>Egle parva</i> Robineau-Desvoidy, 1830		X	
<i>Egle rhinotmeta</i> (Pandellé, 1900)		X	
<i>Emmesomyia socia</i> (Fallén, 1825)		X	
<i>Eustalomyia hilaris</i> (Fallén, 1823)		X	
<i>Eustalomyia histrio</i> (Zetterstedt, 1838)		X	
<i>Fucellia maritima</i> (Haliday, 1838)			
<i>Fucellia tergina</i> (Zetterstedt, 1845)			
<i>Heterostylodes nominabilis</i> (Collin, 1947)		X	
<i>Hydrophoria ruralis</i> (Meigen, 1826)		X	
<i>Hylemya nigrimana</i> (Meigen, 1826)		X	
<i>Hylemya urbica</i> Van der Wulp, 1896			
<i>Hylemya vagans</i> (Panzer, 1798)			
<i>Hylemya variata</i> (Fallén, 1823)		X	
<i>Lasiomma seminitidum</i> (Zetterstedt, 1845)			

<i>Lasiomma strigilatum</i> (Zetterstedt, 1838)			
<i>Leucophora brevifrons</i> (Stein, 1916)	X		
<i>Leucophora cinerea</i> Robineau-Desvoidy, 1830			
<i>Leucophora dissimilis</i> (Villeneuve, 1920)		X	
<i>Leucophora personata</i> (Collin, 1922)		X	
<i>Leucophora subspensa</i> Michelsen in Michelsen & Báez, 1985		X	
<i>Leucophora unistriata</i> (Zetterstedt, 1838)		X	
<i>Mycophaga testacea</i> (Gimmerthal, 1834)		X	
<i>Paradelia intersecta</i> (Meigen, 1826)		X	
<i>Paregle audacula</i> (Harris, 1780)			X
<i>Pegomya bicolor</i> (Wiedemann, 1817)			X
<i>Pegomya cunicularia</i> (Rondani, 1866)	X		
<i>Pegomya flavifrons</i> (Walker, 1849)		X	
<i>Pegomya fulgens</i> (Meigen, 1826)		X	
<i>Pegomya rufina</i> (Fallén, 1825)			
<i>Pegomya solennis</i> (Meigen, 1826)	X		
<i>Pegomya testacea</i> (De Geer, 1776)			
<i>Pegomya ulmaria</i> (Rondani, 1866)			
<i>Pegomya winthemi</i> (Meigen, 1826)		X	
<i>Pegoplata infirma</i> (Meigen, 1826)		X	
<i>Phorbia fumigata</i> (Meigen, 1826)		X	
<i>Phorbia melania</i> Ackland & Michelsen, 1987	X		
<i>Phorbia moliniaris</i> (Karl, 1917)	X		
<i>Subhylemyia longula</i> (Fallén, 1824)			
<i>Zaphne divisa</i> (Meigen, 1826)	X		
<i>Zaphne inuncta</i> (Zetterstedt, 1838)		X	

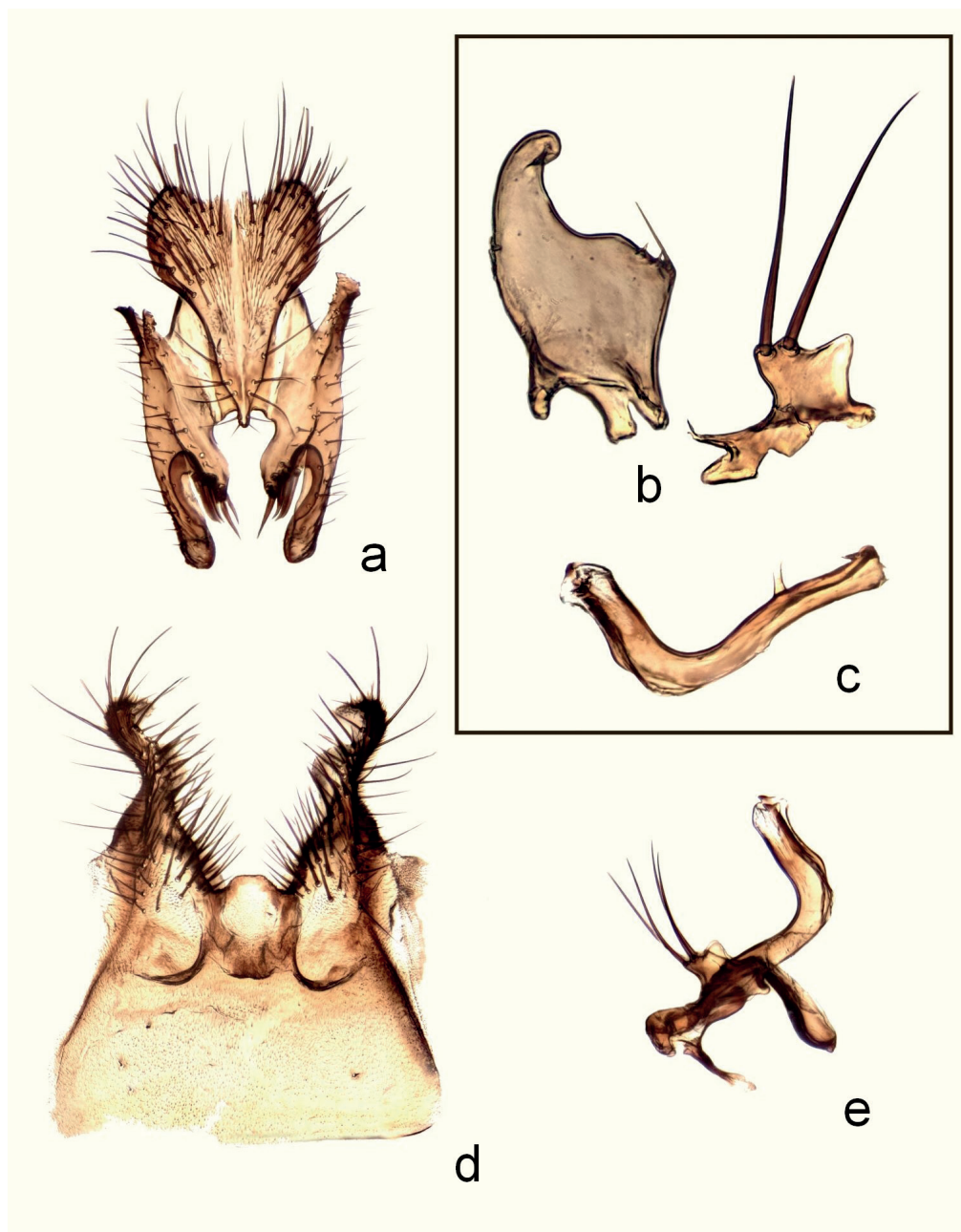


Fig. 15: *Anthomyia liturata*, male terminalia: a) Cercal plate and surstyli, caudal view; b) Gonites; c) Phallus; d) Sternite V, ventral view; e) Phallus and gonites, lateral view.

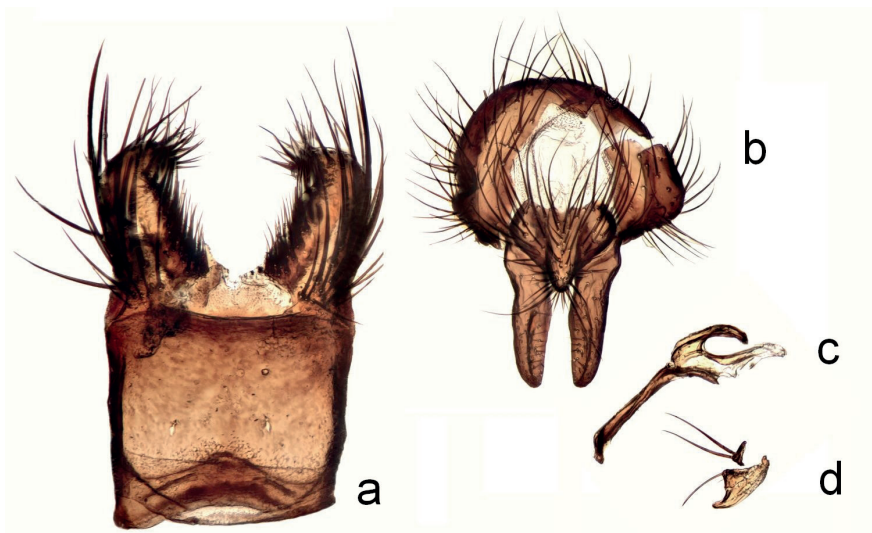


Fig. 16: *Botanophila striolata*, male terminalia: a) Sternite V, ventral view; b) Hypopygium, caudal view; c) Phallus; d) Gonites.

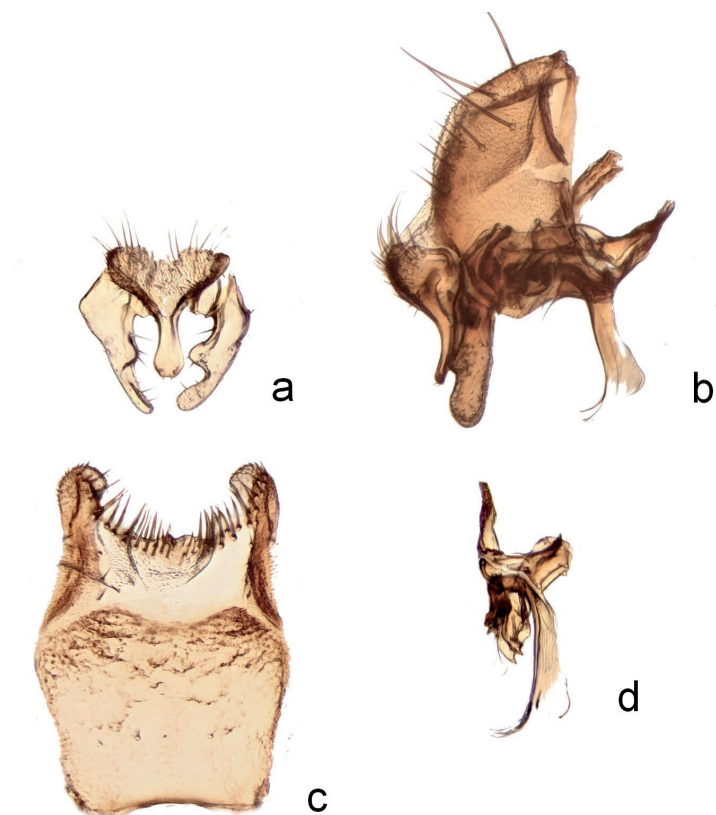


Fig. 17: *Egle parva*, male terminalia: a) Cercal plate and surstyli, caudal view; b) Hypopygium, lateral view; c) Sternite V, ventral view; d) Pre- and postgonites, lateral view.

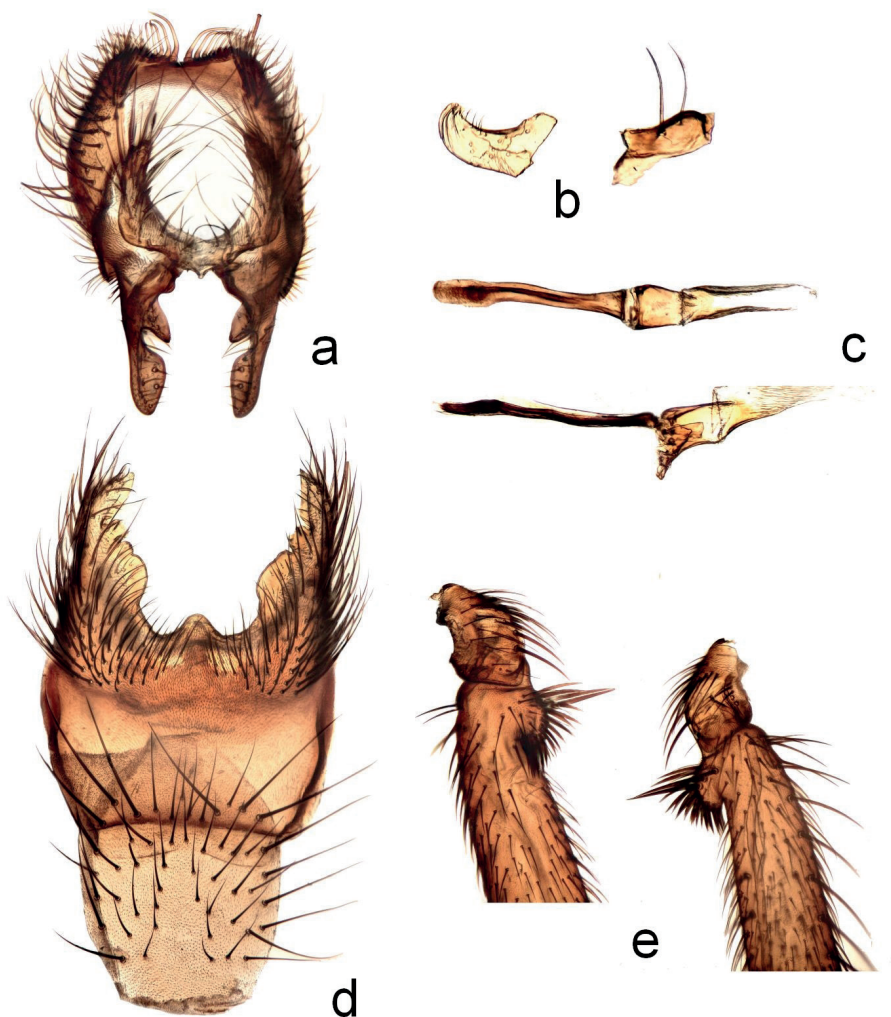


Fig. 18: *Fucellia maritima*, male terminalia and detail of the hind leg: a) Hypopygium, caudal view; b) Gonites; c) Phallus; d) Sternite V, ventral view; e) Ventral knob at the base of hind femur seen from the outside (left) and from the inside (right).

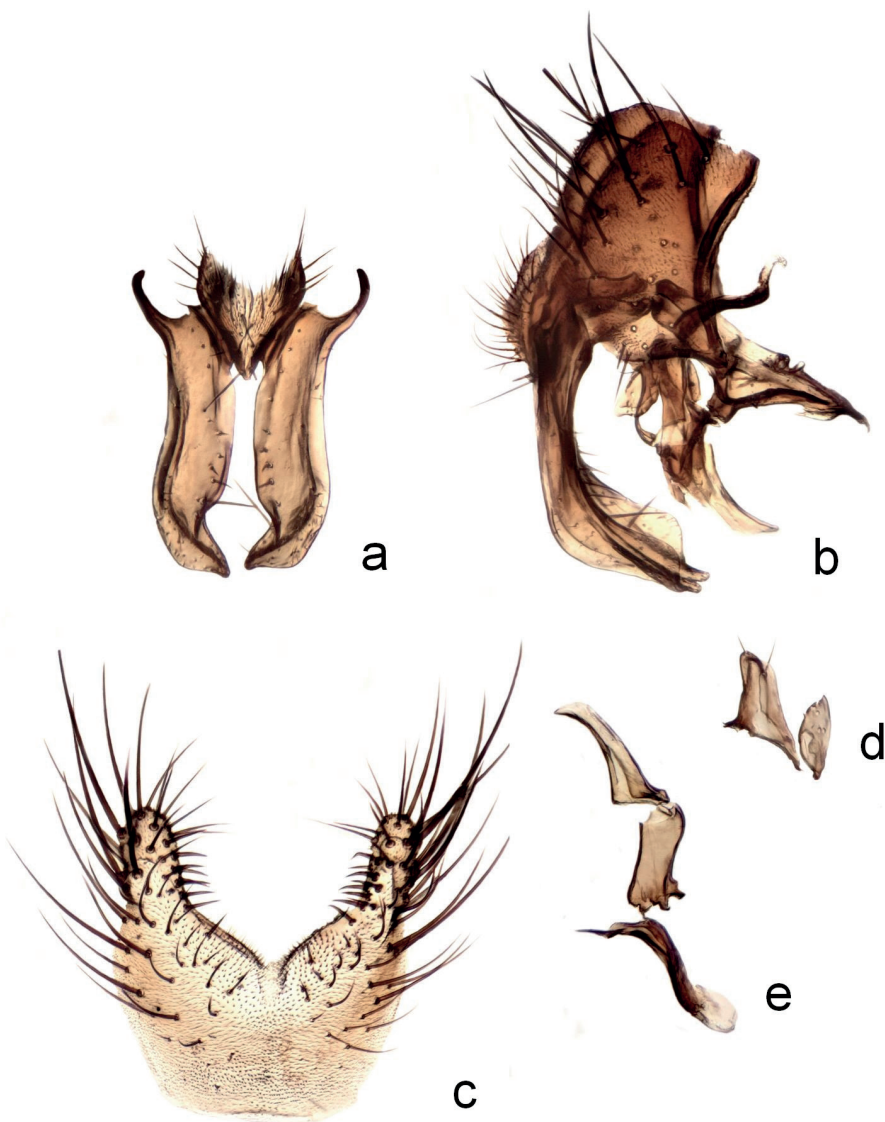


Fig. 19: *Heterostylodes nominabilis*, male terminalia: a) Cercal plate and surstyli, caudal view; b) Hypopygium, lateral view; c) Sternite V, ventral view; d) Gonites; e) Phallus.

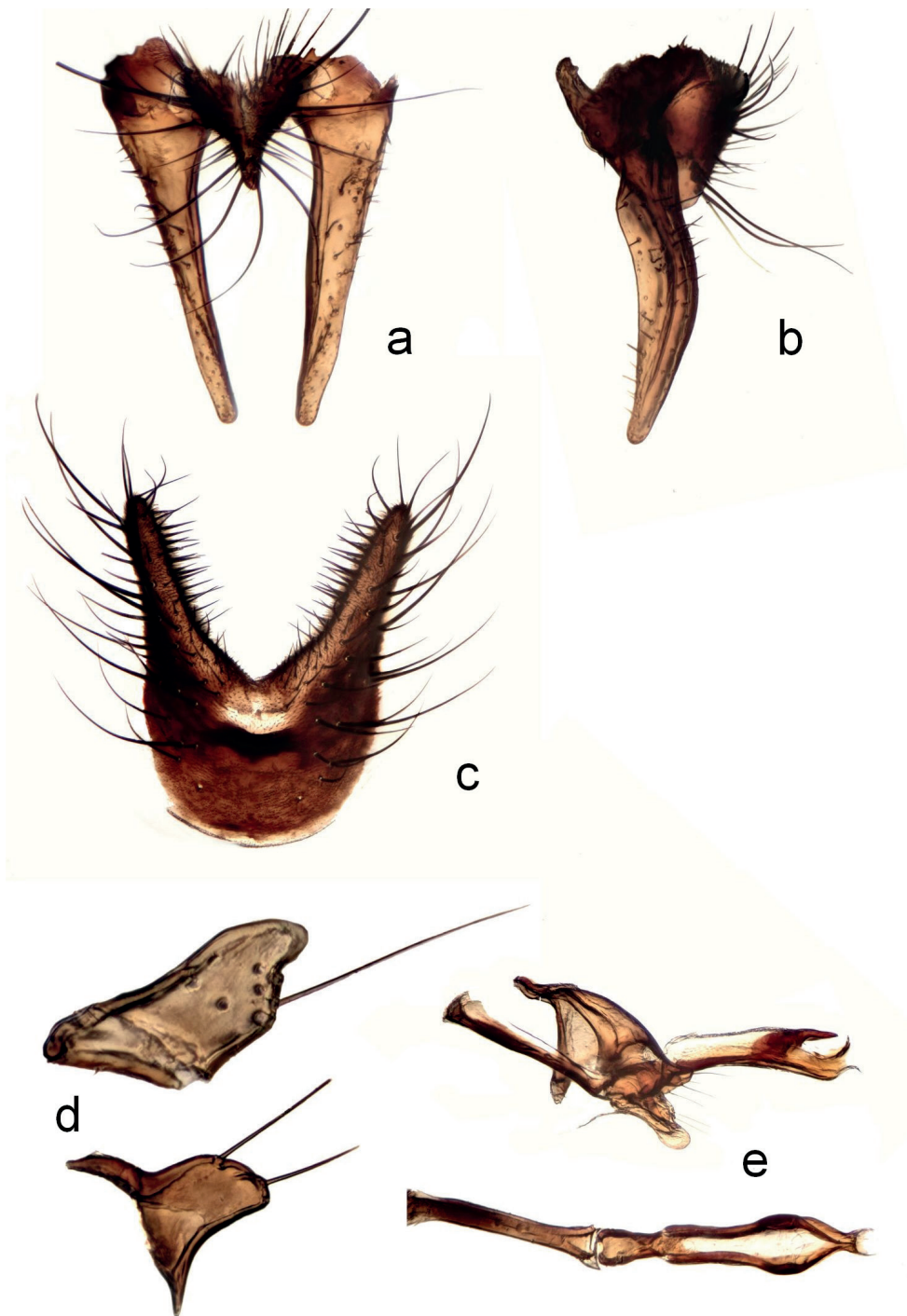


Fig. 20: *Leucophora subsponsa*, male terminalia: a) Cercal plate and surstyli, caudal view; b) Cercal plate and surstyli, lateral view; c) Sternite V, ventral view; d) Gonites; e) Phallus.

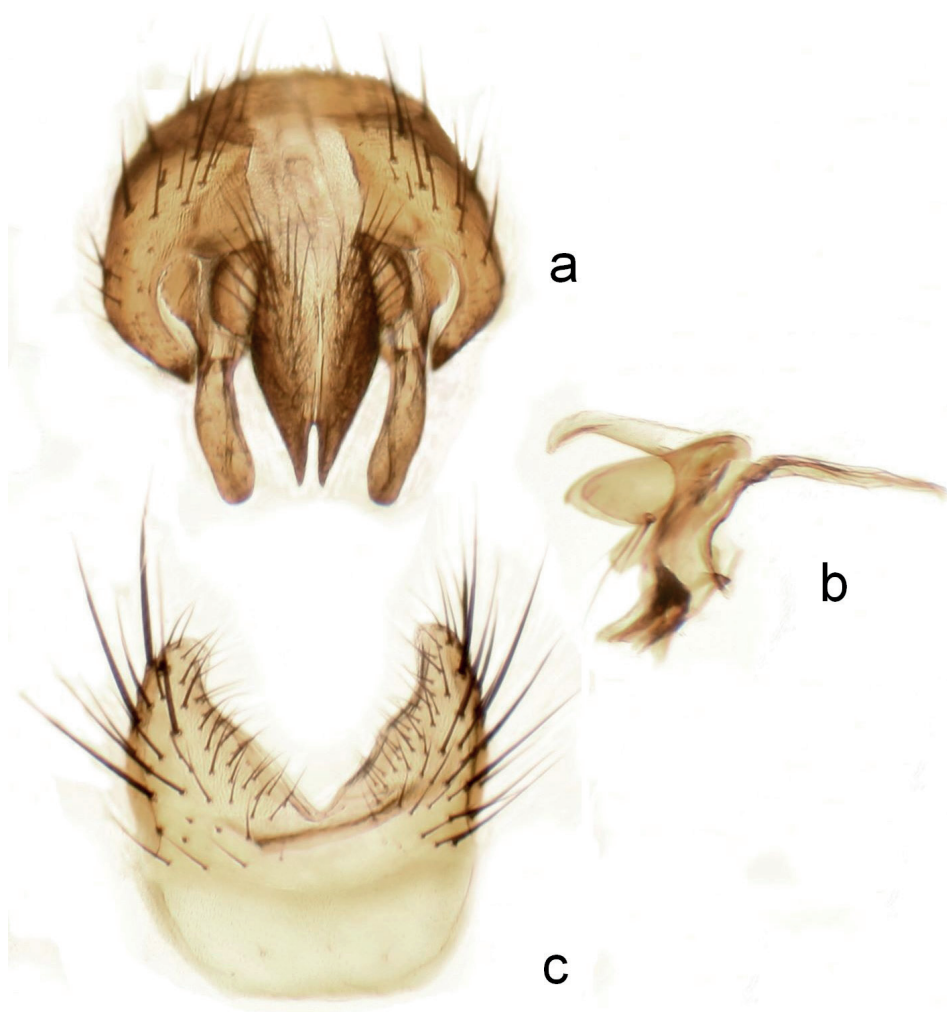


Fig. 21: *Mycophaga testacea*, male terminalia: a) Hypopygium, caudal view; b) Phallus and gonites, lateral view; c) Sternite V, ventral view.

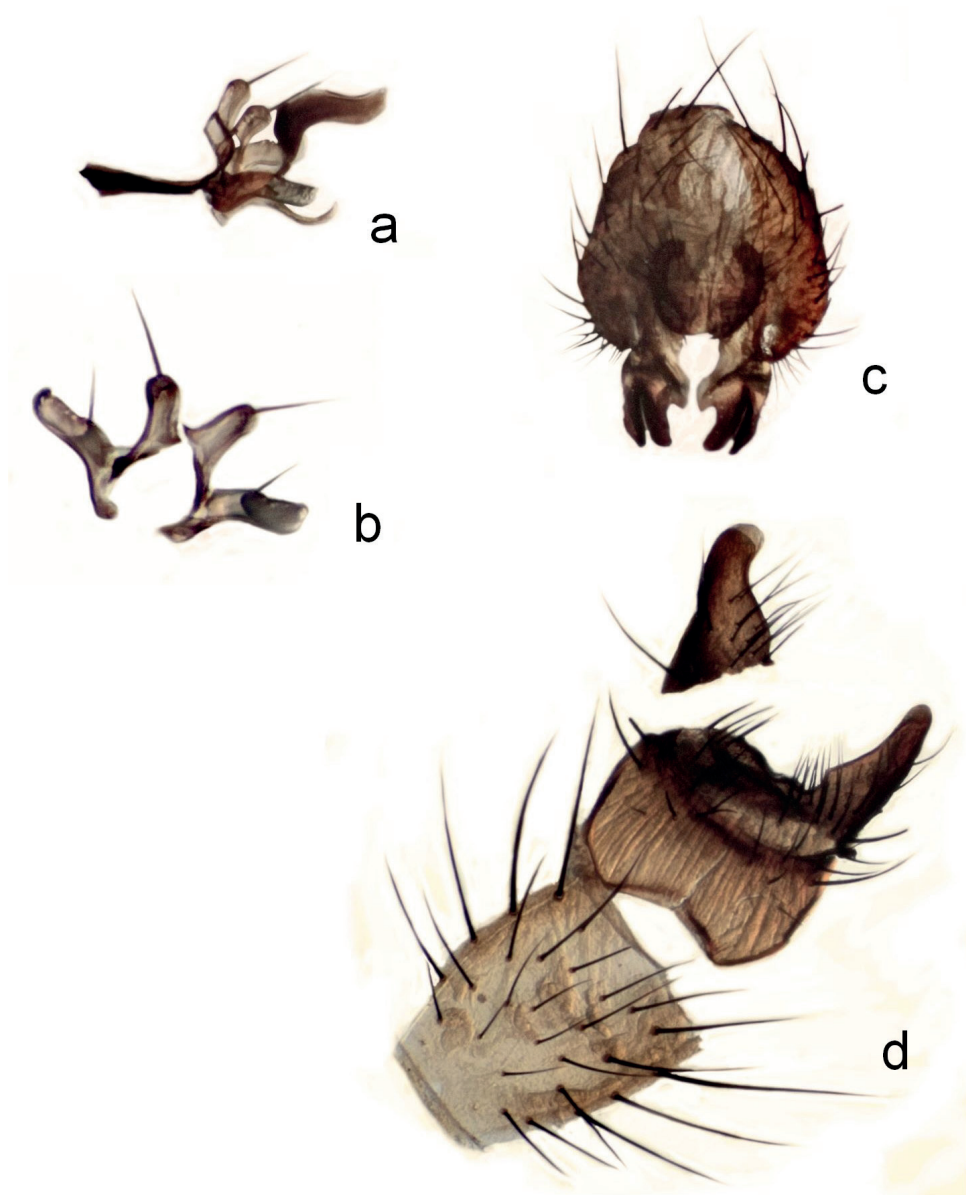


Fig. 22: *Pegomya flavifrons*, male terminalia: a) Phallus and gonites, lateral view; b) Gonites; c) Hypopygium, caudal view; d) Sternites IV and V, ventral view.

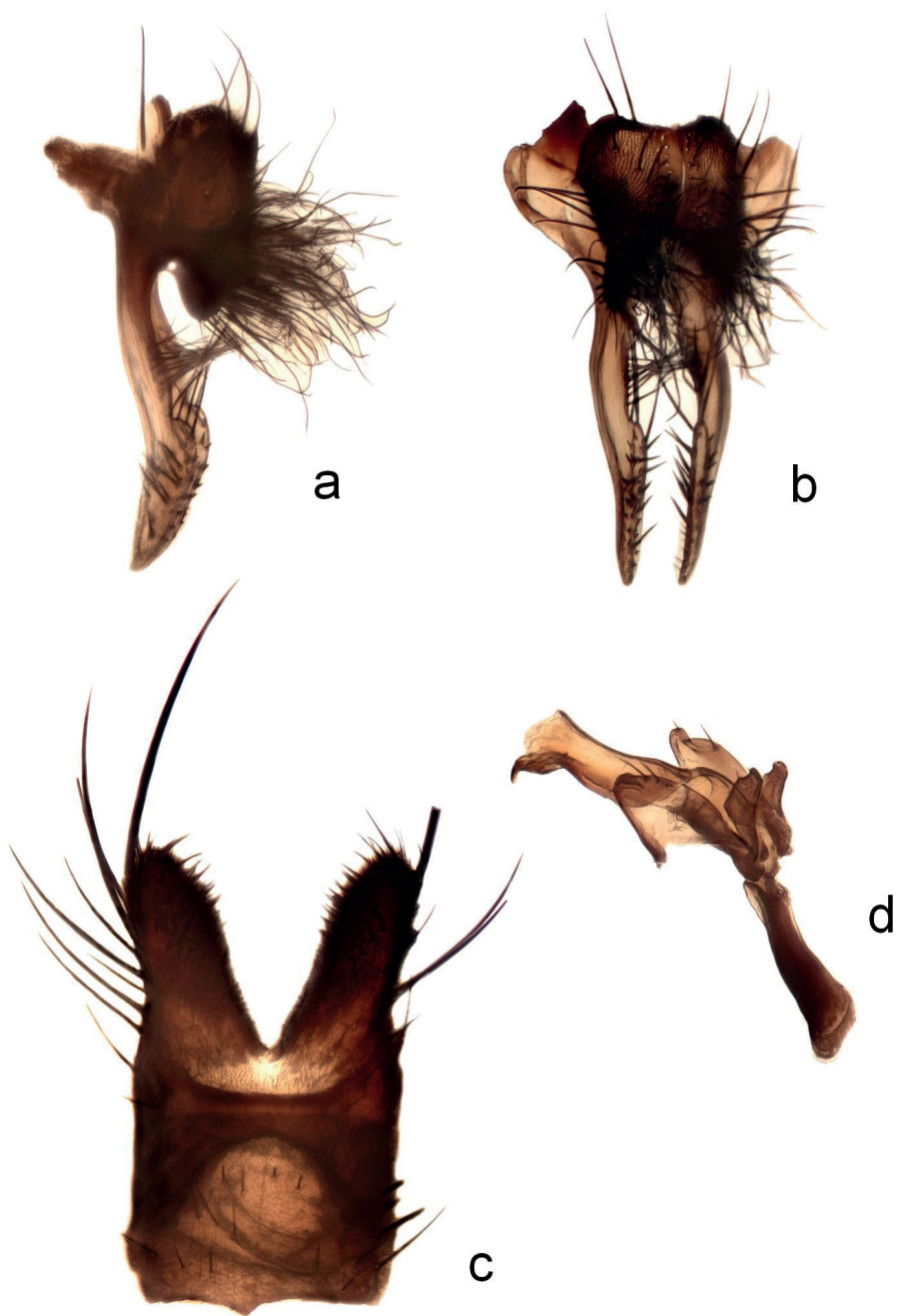


Fig. 23: *Phorbia melania*, male terminalia: a) Cercal plate and surstyli, lateral view; b) Cercal plate and surstyli, caudal view; c) Sternite V, ventral view; d) Phallus and gonites, lateral view.

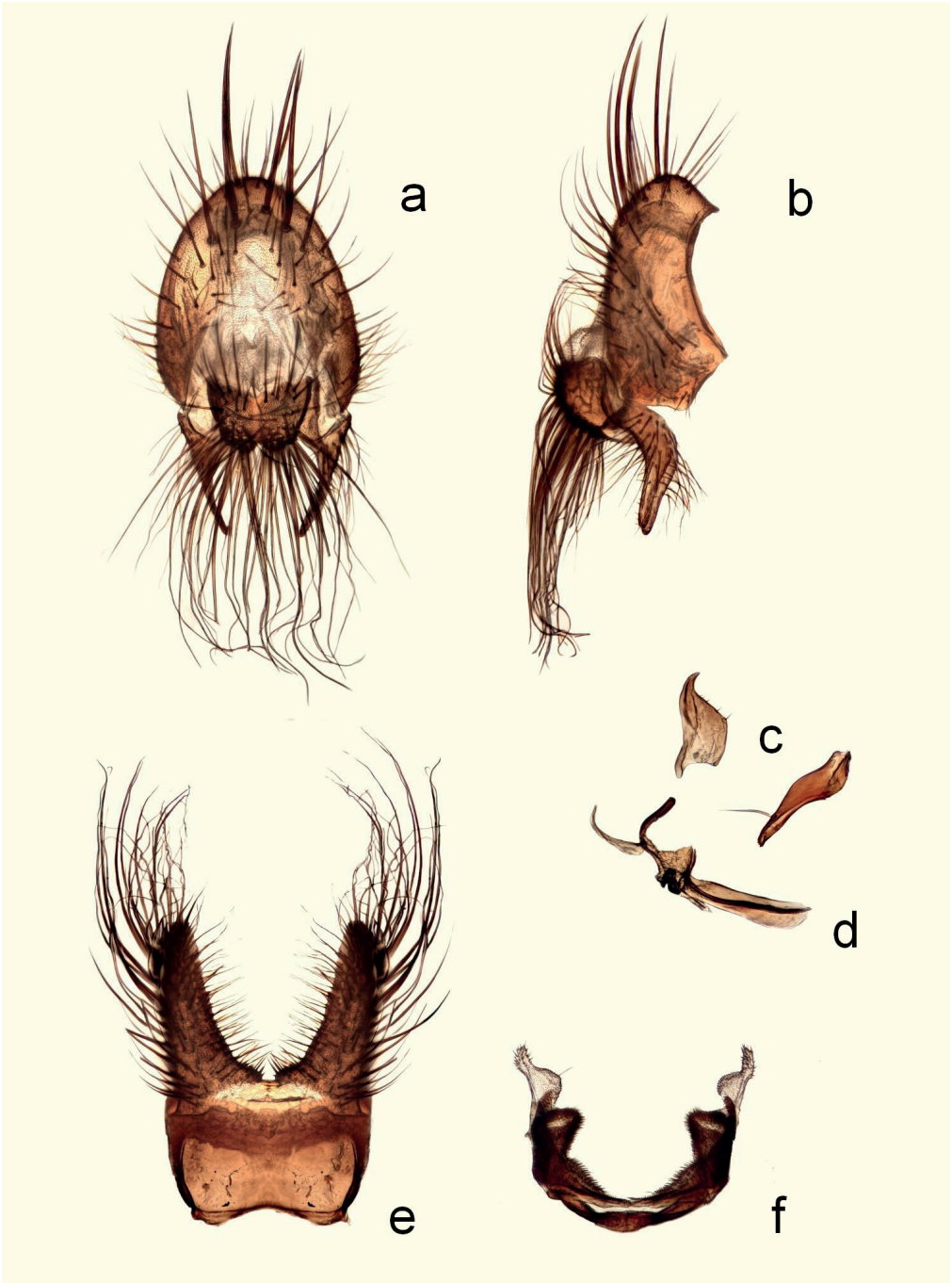


Fig. 24: *Zaphne inuncta*, male terminalia: a) Hypopygium, caudal view; b) Hypopygium, lateral view; c) Gonites; d) Phallus and gonites, lateral view; e) Sternite V, ventral view; f) Hypandrium.

Discussion

Until the publication of the catalogue of Iberian Diptera just over 20 years ago, only 17 species of Anthomyiidae were known for mainland Portugal (Michelsen & Báez, 2002). Since then, Lourenço *et al.* (2020) and Farinha *et al.* (2014) contributed with the addition of two more species, and with the record of *Anthomyia quinque maculata* in the Fauna Europaea website (Michelsen, 2013), the number of known species was increased to 20. This low number of known species, given the reasonable diversity of this family at European level (almost 500 species), can be explained, at least in part, by the reduced investment in the study of Diptera in the country (with groups without medical and economic importance receiving little to no attention), lack of experts in the family not only at European level, but also worldwide, and also by the fact that species of Anthomyiidae are often unattractive to many entomologists due to their dull appearance and difficulty in identification, with the frequent need to study the genitalia of males to identify the species.

As a way to help change this scenario, non-systematic sampling was carried out over more than 10 years in mainland Portugal, in a wide range of habitats (Fig. 3), which resulted in a significant increase in the number of known species. A total of 52 species were discovered as new to the fauna of Portugal, 12 of which are also new to the Iberian Peninsula. Another three that were already known from the Atlantic archipelagos of the Azores and Madeira were now recorded for the first time in the mainland. This brings the number of known species for mainland Portugal to 75, a nearly four-fold increase in the number of known species. Despite this significant increase, and taking into account that in neighbouring Spain more than twice as many species are known (Michelsen & Báez, 2002), we expect that many species will still be recorded. This is likely to be the case of species of the genera *Alliopsis* Schnabl & Dziedzicki, 1911 and *Chiastocheta* Pokorný, 1889, which were not detected in this study, but which in Spain are represented by several species, some of which, given their wide distribution, are likely to be present in mainland Portugal as well.

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