

# New records of dance flies (Hybotidae) and dagger flies (Empididae) in Sweden and a significant addition of genetic barcodes of the Swedish empidoid fauna

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Wahlberg, E., Rhodén, C & Johanson, KA.: New records of dance flies (Hybotidae) and dagger flies (Empididae) in Sweden and a significant addition of genetic barcodes of the Swedish empidoid fauna. [**Nya fynd av puckeldansflugor (Hybotidae) och dansflugor (Empididae) i Sverige och ett viktigt bidrag av genetiska streckkoder av den svenska empidoidfaunan.**] – Entomologisk Tidskrift 140 (2): 133–144. Uppsala, Sweden 2019. ISSN 0013-886x.

Three species are recorded for the first time in Sweden, *Rhamphomyia erythropthalma* Meigen, 1830, *R. lamellata* Collin, 1926, and *Platypalpus pygialis* Chvala, 1973, and additionally new provincial records for several species from both Hybotidae and Empididae are presented. We also provide DNA barcode sequences from 71 species, submitted to the Barcode of Life Database together with geographical data and images. This increases the taxonomical representation of Swedish taxa in the database with over 30%. A much-needed addition to aid in modern molecular methods relying on high coverage of quality reference data. The dance fly *Oeadalea ringdahli* Chvála, 1983 is also presented with an image of a female specimen for the first time.

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The superfamily Empidoidea (Diptera) Latreille, 1809 includes over 10,000 described species (Moulton & Wiegmann 2007; Pape *et al.* 2011; Wahlberg & Johanson 2018). While the superfamily is represented worldwide except for Antarctica (Sinclair & Cumming 2006), the diversity of several groups is highest in temperate areas. In Sweden, the family Hybotidae is represented by 166 species and the Empididae (*sensu* Wahlberg & Johanson 2018) by 226 species (Dyntaxa 2019). Species in

both Hybotidae and Empididae are greatly diverse in both morphology and life histories and occupy a vast variety of habitats. One species may be dependent on several different patches for feeding, hunting, breeding and depositing eggs. The larvae again may occupy a completely different habitat than the adults. Using Diptera in general and empidoids in particular in modern applied research, as ecological surveys using biological indicators, raises the focus on difficulties in iden-

tification to species level due to the large number of taxa in some families and the general lack of available and updated identification keys (Orford *et al.* 2015). Research on the biology of the families is scattered, partially a consequence of past taxonomical problems inhibiting a compiled and thorough synthesis of life histories.

The Barcode of Life Data Systems (BOLD, Ratnasingham & Hebert 2007) is the largest international database for storing and analysing genetic barcodes. The genetic barcodes are species specific DNA sequences from selected regions in the genome, and can be used for species delimitation and identification, population studies and to some extent phylogenetics (Folmer *et al.* 1994, Hebert *et al.* 2003). Sweeney *et al.* (2011) examined the use of genetic sequencing as a tool combined with DNA barcode databases and found a considerable increase in the recognition of macroinvertebrate taxa compared to identification carried out by non-experts. Molecular tools in identification of Empidoidea has been little utilized and explored. To date only 858 BINs (clusters of sequencing that might represent a species) of Empididae with DNA barcodes, the Folmer region of cytochrome oxidase I, COI or COX1 (Folmer *et al.* 1994), are available in BOLD and when unidentified species are excluded this number is reduced to 291 species on a global scale. For Hybotidae the same figures are 1090 BINs and 265 known species. This can be compared to the described species in total, for Empididae over 3000 and for Hybotidae 1300.

In this paper new records of species in Hybotidae and Empididae, and a few records of Ragaidae, in Sweden are presented, as well as a considerable amount of new DNA barcode data for Swedish taxa. The work presented in this paper is the result of a research project on the systematics and taxonomy of Scandinavian Empidoidea, with emphasis on the Swedish diversity of Empididae and Hybotidae, supported by the Swedish Taxonomy Initiative.

## Material and methods

Most of the material in this paper was collected through the Swedish Malaise Trap Project (SMTP, Karlsson *et al.* 2005). Additional material comes from additional collection events both by the author and associates at the Swedish Museum of Natural History (NHRS). Photos were produced using a

Nikon DS-Ri2 mounted on a motorized Nikon SMZ microscope, and automatic focus stacking carried out directly in Nikon NIS-Elements 5.10 connected to the camera. Photos were edited and finalized in Adobe Photoshop CC 20.0.1.

For extraction of DNA sequences, the KingFisher™ Duo (Thermo Scientific, Waltham, MA, U.S.A.) extraction robot was used together with KingFisher™ Cell and Tissue DNA Kit (Thermo Scientific) according the manufacturers protocols. For most specimens one leg was removed for extraction of tissue, and thereafter returned to a voucher with the rest of the body. For very small specimens the whole body had to be used for extraction to produce enough material. Vouchers are kept in 80% ethanol at the Swedish Museum of Natural History (SMNH). Then lysis was performed overnight at 56°C. PCR reactions were set up with Ready-To-Go PCR Beads (Amersham Biosciences, U.K.), and a mixture of 21 µl H<sub>2</sub>O, 1 µl each of reverse and forward primer and 2 µl DNA extract. The standard primers for the barcode region of the COI gene was used, LCO1490 (GGTCAACAAATCATAAAGATATTGG) for forward sequencing direction and HCO2198 (TAAACTTCAGGGTGACCAAAAAATCA) for reverse sequencing direction (Folmer *et al.* 1994). The PCR cycling protocol was set up with an initial denaturation step of 95°C for 5 min, followed by 30 amplification cycles of 95°C for 30 s, 50°C for 30 s, 72°C for 50 s, and finally one final extension of 72°C for 8 min. The PCR products were cleaned using Exo-Fast (QiaQuick PCR Purification Kit; Qiagen, Inc., Valencia, CA, U.S.A.) and thereafter sequenced by Macrogen Inc. (South Korea). The same primer pair as for PCR reaction was used for sequencing. The gene fragments were assembled into contigs, inspected and cleaned from primer sequences in Geneious 8.1.8 (Kearse *et al.* 2012). The sequences were screened for contamination and erroneous species determination by comparing sequences of relatives as well as the BOLD and GenBank databases using the blast option (Madden 2013). All geographical records are presented with latitude and longitude decimal degrees (WGS 84). Previous records are based on data in ArtDatabanken (the Swedish Species Observation System), catalogues and available data in GBIF. Abbreviations of Swedish provinces are: Sk – Skåne, Bl – Blekinge, Ha – Halland,

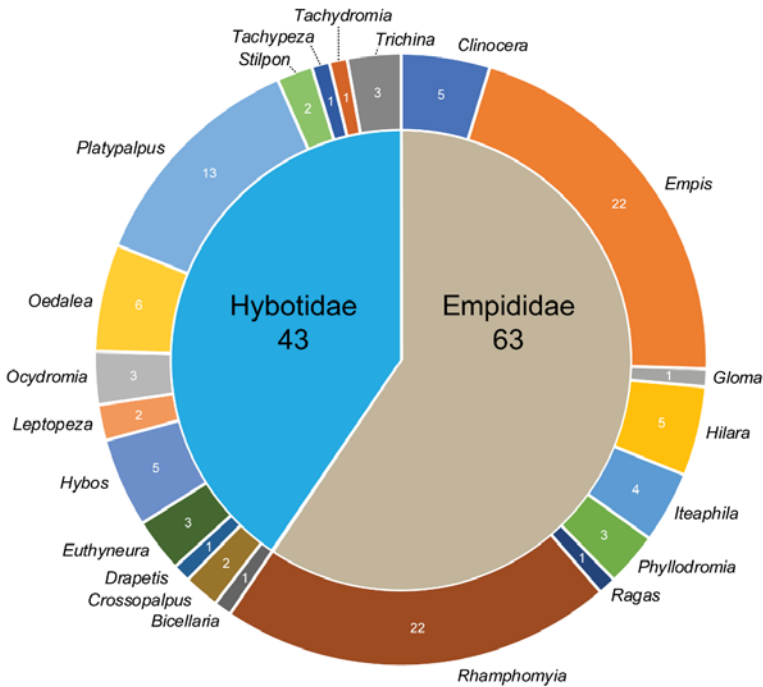


Figure 1. Number of barcoding sequences uploaded from this project to BOLD per family and genus.

Figur 1. Antal streckkods-sekvenser uppladdade från detta projekt till BOLD per familj och släkte.

Sm – Småland, Öl – Öland, Go – Gotland, Ög – Östergötland, Vg – Västergötland, Bo – Bohuslän, Ds – Dalsland, Nä – Närke, Sö – Södermanland, Up – Uppland, Vs – Västmanland, Vr – Värmland, Dr – Dalarna, Gä – Gästrikland, Hs – Hälsingland, Me – Medelpand, Hr – Härjedalen, Jä – Jämtland, Ån – Ångermanland, Vb – Västerbotten, Nb – Norrbotten, Ås – Åsele lappmark, Ly – Lycksele lappmark, Pi – Piteå lappmark, Lu – Luleå lappmark and To – Torne lappmark.

## Results

### Additions of DNA barcodes for Swedish Empididae and Hybotidae

A total of 106 COI sequences from both male and female specimens (Fig. 1) were uploaded to BOLD, representing 71 unique species, validated and barcode compliant. Of these, 37 were not present in the BOLD database previously with full data including photos and the complete 658 bp barcode sequence region and trace files. These 37 barcodes increase the number of records for the Swedish fauna of the families Empididae

and Hybotidae with 32% in BOLD (originally 116 records). For Empididae the increase is 71% (27 added records, originally 38 records) and for Hybotidae 13% (10 added records, originally 78). In addition to DNA sequences, all records contain photos of specimens and both temporal and geographical data. All data submitted to BOLD, including additional sequences (e.g. non barcode compliant) are available publicly through both the BOLD search engine and an interactive project dataset page found at [http://www.boldsystems.org/index.php/Public\\_SearchTerms?query=DS-SEEMP19](http://www.boldsystems.org/index.php/Public_SearchTerms?query=DS-SEEMP19).

### Species new to Sweden

*Rhamphomyia erythrophthalma* Meigen, 1830 (Empididae) (Fig. 2a). This species is previously recorded from Denmark, central Europe and the British islands. The species is relatively small, with dark brown thorax and abdomen lighter brown; the legs are slender, and the fore- and middle tibiae and tarsi comparatively short-haired. 2♂, 3♀ Sk, Ystads kommun, Sandhammaren strand, Järåhusen, border between forest and sandhill dunes, Malaise

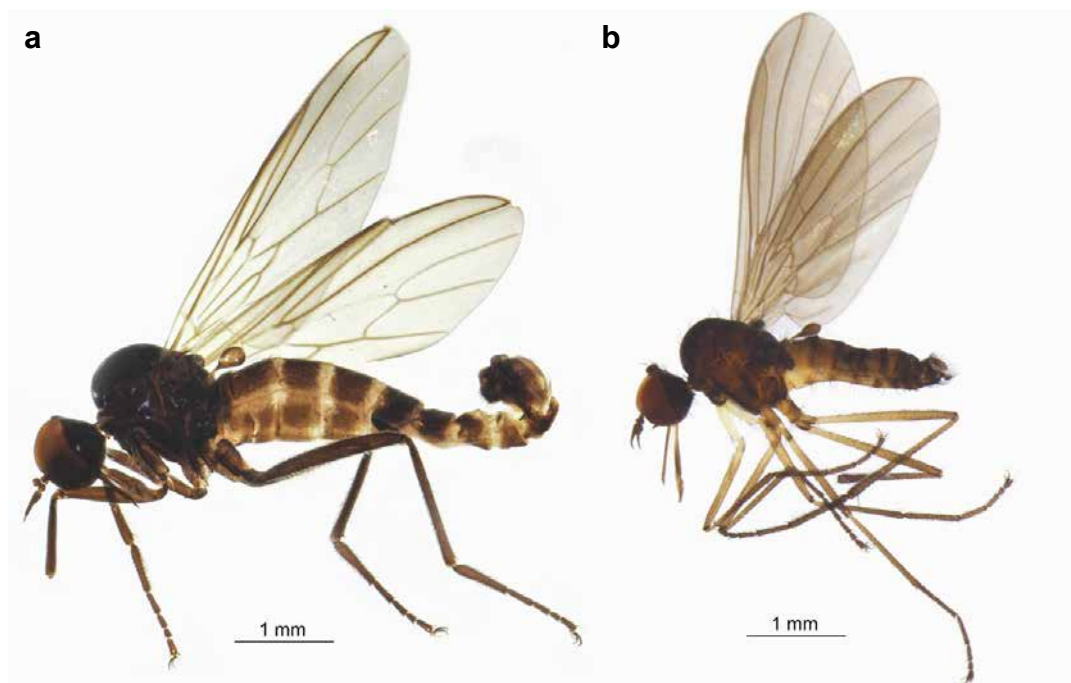


Figure 2. Two new species for Sweden in the genus *Rhamphomyia* (Empididae), male, lateral view. – a) *R. erythrothralma* Meigen, 1830; – b) *R. lamellata* Collin, 1926. Photo: Emma Wahlberg.

Figur 2. Två nya arter för Sverige i släktet *Rhamphomyia* (Empididae), hane, sidovy. – a) *R. erythrothralma* Meigen, 1830; – b) *R. lamellata* Collin, 1926. Foto: Emma Wahlberg.

trap, 55.398072°N, 14.209383°E (Trap ID 1005), 26.ix.2005–10.ii.2006 (Coll. event 1901), leg. SMTP.

*Rhamphomyia lamellata* Collin, 1926 (Empididae) (Fig. 2b). The main distribution of *R. lamellata* is similar to that of *R. erythrothralma* above, however this species was previously recorded from southern Norway by Jonassen (1992), and the occurrence in Sweden was expected. As the species above, it is relatively small, with a black thorax and a lighter brown abdomen. Females are generally more pale coloured than the males. The legs are slender and the coxa and base of femur are yellowish, and the tibiae and tarsi are brownish. 4♂, 6♀ **ÖI**, Mörbylånge, Gamla Skogsby (Kalkstad), mixed deciduous forest, Malaise trap, Trap 113/2014, 27.vi–20.vii.2014, leg. M. & C. Jaschhof.

*Platypalpus pygialis* Chvala, 1973 (Hybotidae) (Fig. 3). Distributed throughout Europe, from the British islands to Russia, but previously not recor-

ded from Scandinavia. The species in this genus are difficult to identify, however, this species can be distinguished from the others in the genus by the presence of a long and white arista. 2♂ **Up**, Knivsta kommun, Rickebasta alsumpskog, western part, alder swamp wood, Malaise trap, 59.734350°N, 17.720417°E (Trap ID 9), 18.vi–6.vii.2003 (Coll. event 355), leg. SMTP.

### New occurrence records in Sweden Empididae

*Chelifera flavella* (Zetterstedt, 1838). Previously known from Sk, Jä, Vb, Ås, Ly and To. New record: 1♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 30.vi–14.vii.2004 (Coll. event 1169), leg. SMTP.

*Chelipoda vocatoria* (Fallén, 1816). This species has been reported from Sm, Up, Me, Ån and Vb. The type-locality is Sk. New records: 1♂, 2♀

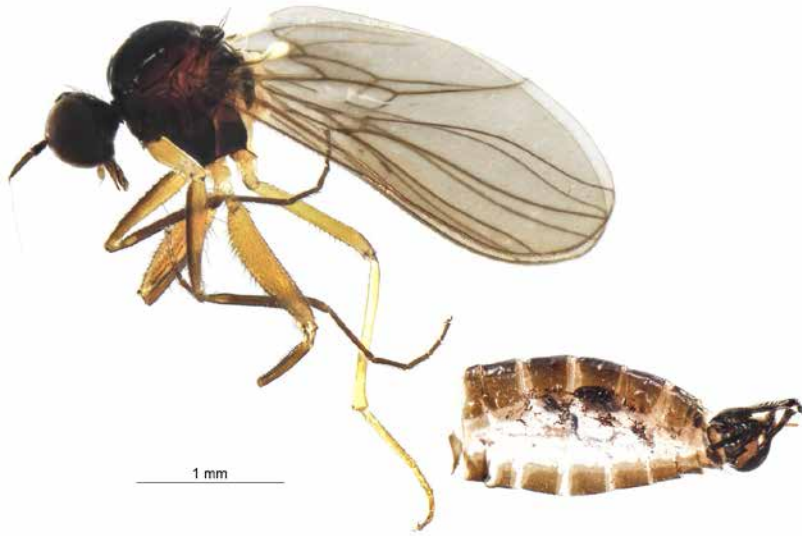


Figure 3. *Platypalpus pygialis* Chvala, 1973 (Hybotidae), male, lateral view. Abdomen has been detached and was macerated during DNA extraction. Photo: Emma Wahlberg.

Figur 3. *Platypalpus pygialis* Chvala, 1973 (Hybotidae), hane, sidovy. Bakkroppen separerad och masererades under DNA-extrahering. Foto: Emma Wahlberg.

**Ög**, Ödeshögs kommun, Omberg, Storpissan, old Norway spruce wood, Malaise trap, 58.334917°N, 14.655000°E (Trap ID 15), 5.vi–19.vii.2005 (Coll. event 1660), leg. SMTP. 1♀ **Vg**, Laxå kommun, Finnerödja, Tottsjömo, marsh, pitfall trap, 58.930778°N, 14.345355°E, 18–20.vii.2016, leg. E. Wahlberg.

*Clinocera fontinalis* (Haliday, 1833) Previously only known from Sk and Vb. 1♂ **Sö**, Nyköpings kommun, Torpesta kvarn, along stream in vegetation, sweep net, 58.932709°N, 17.176886°E, 11.iv.2016, leg. E. Wahlberg. New records: 1♂ **Ög**, Ödeshögs kommun, Omberg, bokskogsreservatet, beech forest, Malaise trap, 58.297183°N, 14.634817°E (Trap ID 16), 5–19.vii.2005 (Coll. event 1667), leg. SMTP. 1♂ **Vg**, Laxå kommun, Finnerödja, Tottsjömo, marsh, pitfall trap, 58.930778°N, 14.345355°E, 18–20.vii.2016, leg. E. Wahlberg.

*Empis vitripennis* Meigen, 1822. Previous records from Sk, Ha, Sm, Ög and Vg. This record from Vr is the northernmost find. New record: 6♂, 5♀ **Vr**, Munkfors kommun, Ransäter, Rudstorp, sandy railway embankment through pastureland, Malaise trap, 59.772956°N, 13.473714°E (Trap ID 1002), 15–23.vii.2005 (Coll. event 1376), leg. SMTP.

*Empis aestiva* Loew, 1862. A species with dominant southern distribution in Sweden, reported from Sk, Ha, Sm, Öl, Ög, Vg, Bo, Sö and

Up. New record: 2♂, 3♀ **Go**, Gotlands kommun, Rembs, middle elevation slope, lichen-rich pine forest on sand dunes, Malaise trap, 56.933393°N, 18.268783°E (Trap ID 29), 21.vi–12.vii.2005 (Coll. event 1395), leg. SMTP.

*Empis bicuspadata* Collin, 1927. A widespread species previously reported from Sk, Bl, Sm, Öl, Go, Up, Vr, Dr, Me, Ån, Vb, Nb, Ås and Ly. New records: 6♂ **Vs**, Sala kommun, Västerfärnebo, Nötmyran (birches at Islingby, Östermyran), hay meadow, Malaise trap, 59.941959°N, 16.309450°E (Trap ID 11), 8–16.vi.2004. 11 (Coll. event 418), leg. SMTP. 1♂ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 15–29.vi.2005 (Coll. event 1907), leg. SMTP.

*Empis caudatulula* Loew, 1867. A mostly southern distributed species with records from Sk, Sm, Go, Vg, Bo and Sö. New record: 1♂ **Öl**, Mörbylånga, Kalkstad NR, mixed deciduous forest, Malaise trap, Jaschhof #64/2014, 27–28.v.2014, leg. M. & C. Jaschhof.

*Empis planetica* Collin, 1927. A species confined to middle to southern parts of Sweden, reported from Sk, Sm, Vg, Bo, Up, Vs and Dr. New records: 10♂, 28♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll.



event 1385), leg. SMTP. 2♂ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 3051), leg. SMTP.

*Empis serotina* Loew, 1867. This is a very rarely reported species, with only records from Sk and Ha. This new record is from even further north. New record: 1♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 22.v–5.vi.2005 (Coll. event 1384), leg. SMTP.

*Empis stercorea* Linnaeus, 1761. A very common and widespread species, only absent in Go, Ds, Vr, Hs, Hr, Pi, Lu and To. New record: 6♂, 5♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll. event 1385), leg. SMTP.

*Gloma fuscipennis* Meigen, 1822. Fragmented distribution and rarely collected, with previous records from Sk, Ha, Vg, Ög, Vr, Jä, Ån, Vb and Ås. New records: 1♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 30.vi–14.vii.2004 (Coll. event 1169), leg. SMTP. 7♂ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 27.vi–10.vii.2005 (Coll. event 1387), leg. SMTP. 1♀ **Up**, Uppsala kommun, Fiby urskog, Trefaldighets källa, mixed deciduous forest along brook, Malaise trap, 59.883400°N, 17.193050°E (Trap ID 25), 29.vi–22.vii.2003 (Coll. event 450), leg. SMTP. 1♀ **Sm**, Gränna kommun, Lönnemålen, norway spruce forest with big harvested ashes, Malaise trap, 58.048917°N, 14.573033°E (Trap ID 17), 15.vi–1.vii.2005 (Coll. event 1515), leg. SMTP.

*Heleodromia boreoalpina* Saigusa, 1963. This species previously only been reported from Ån. New record: 2♂, 1♀ **To**, Kiruna kommun, Abisko nationalpark, Nuolja, bare mountain, Malaise trap, 68.359492°N, 18.719197°E (Trap ID 1007), 1–13.vii.2005 (Coll. event 1982), leg. SMTP.

*Heleodromia immaculata* Haliday, 1833. A more common species with wider distribution than

above. Reported from Sm, Bo, Vr, Dr, Hs, Me, Jä, Ån, Vb, Nb, Ås, Ly, Pi and To. New records: 1♀ **Hr**, Härejdalens kommun, Sonfjället, Nyvallens fåbod, alpine birch and spruce forest, Malaise trap, 62.316683°N, 13.56855°E (Trap ID 42), 21.v–17.vi.2004. (Coll. event 650), leg. SMTP. 1♂ **Up**, Uppsala kommun, Fiby urskog, Trefaldighets källa, mixed deciduous forest along brook, Malaise trap, 59.883400°N, 17.193050°E (Trap ID 25), 29.vi–22.vii.2003, (Coll. event 450), leg. SMTP.

*Hilara chorica* (Fallén, 1816). *Hilara* is the second largest genus of Empididae in Sweden, with 68 known species in Sweden it is only preceded by *Rhamphomyia*. *H. chorica* is found throughout Sweden in Sk, Bl, Ha, Sm, Öl, Ög, Vg, Bo, Up, Dr, Hä, Me, Jä, Ån, Vb, Nb and Ås. New record: 15♂, 11♀ **Vr**, Munkfors kommun, Ransäter, Rudstorp, sandy railway embankment through pasture-land, Malaise trap, 59.772956°N, 13.473714°E (Trap ID 1002), 15–23.vii.2005 (Coll. event 1376), leg. SMTP.

*Hilara flavipes* Meigen, 1822. This species has only been recorded from Sk, Sm, Vg and Bo. The new record here is a considerably more northern find. New record: 2♀ **Ån**, Örnsköldsviks kommun, Skuleskogen, Långrå, brook ravine in mixed forest, Malaise trap, 63.088717°N, 18.498383°E (Trap ID 44), 5–25.vii.2005 (Coll. event 1186), leg. SMTP.

*Hilara gallica* (Meigen, 1804). Distributed throughout Sweden in Sk, Ha, Öl, Bo, Sö, Dr, Me, Jä, Ån and Vb. New records: 1♀ **Go**, Gotlands kommun, Rembs, middle elevation slope, lichen-rich pine forest on sand dunes, Malaise trap, 56.933393°N, 18.268783°E (Trap ID 29), 13–20.vii.2003 (Coll. event 254), leg. SMTP. 2♂, 6♀ **Sm**, Torsås Kommun, Söderåkra, Påboda, small village garden, Malaise trap, 56.434723°N, 16.070844°E (Trap ID 2046), 1.v–1.vi.2008 (Coll. event 2051), leg. SMTP.

*Hilara hybrida* Collin, 1961. This species has previously had a defined northern distribution, in Dr, Gä, Jä, Ån, Vb, Nb, Ås, Ly, Pi, Lu and To. New record: 1♀ **Sm**, Torsås Kommun, Söderåkra, Påboda, small village garden, Malaise trap, 56.434723°N, 16.070844°E (Trap ID 2046), 1.v–1.vi.2008 (Coll. event 2051), leg. SMTP.

*Rhamphomyia anomalipennis* Meigen, 1822. A rarely collected species with only a few known records from Sk, Dr, Hr, Jä, Ås, Ly, Lu and To. New record: 1♂ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise

trap, 56.427648°N, 16.421110°E (Trap ID 3001), 15.v–9.vi.2014 (Coll. event 3050), leg. SMTP.

*Rhamphomyia curvula* Frey, 1913. A species with widespread distribution, with records from Sk, Sm, Ög, Sö, Dr, Jä, Ån, Vb, Ås and To. New record: 1♀ **To**, Kiruna kommun, Abisko nationalpark, Nuolja, bare mountain, Malaise trap, 68.359492°N, 18.719197°E (Trap ID 1007), 1–13.vii.2005 (Coll. event 1982), leg. SMTP.

*Rhamphomyia dudai* Oldenberg, 1927. A very rare species and few records are available. Previously only found in Sm, Ög, Me and Ån. New record: 3♂, 11♀ **Up**, Uppsala kommun, Fiby urskog, Trefaldighets källa, mixed deciduous forest along brook, Malaise trap, 59.883400°N, 17.193050°E (Trap ID 25), 29.vi–22.vii.2003 (Coll. event 450), leg. SMTP.

*Rhamphomyia rufipes* Zetterstedt, 1838. Known only from Vb and To previously. New record: 3♂, 10♀ **Lu**, Gällivare kommun, Ätnarova försökspark, Peltovaara, lingonberry pine forest, Malaise trap, 67.051717°N, 20.385900°E (Trap ID 48), 30.vi–8.vii.2004 (Coll. event 1207), leg. SMTP.

*Rhamphomyia sciarina* (Fallén, 1816). Fairly common, with records in Sm, Go, Ög, Vg, Bo, Up, Vs, Dr, Me, Ån and Vb. New record: 1♂ **Vr**, Munkfors kommun, Ransäter, Rudstrorp, Sandy railway embankment through pasture-land, Malaise trap, 59.772956°N, 13.473714°E (Trap ID 1002), 15–23.vii.2005 (Coll. event 1376), leg. SMTP.

*Rhamphomyia stigmosa* Macquart, 1827. Widespread, with previous records from Sk, Ha, Sm, Vg, Up, Jä, Vb, Ly, Pi and Lu. New record: 1♂, 1♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 30.vi–14.vii.2004 (Coll. event 1169), leg. SMTP.

*Rhamphomyia trilineata* Collin, 1926. Widespread from north to south as above, with records from Sk, Ha, Sm, Sö, Dr, Jä, Nb, Ås, Ly and To. New record: 1♀ **Bo**, Stenungsunds kommun, Kolhättan (Ödsmål), Hällsberget, broad-leaved deciduous forest, Malaise trap, 58.140933°N, 11.856200°E (Trap ID 31), 14.iv–25.v.2004 (Coll. event 515), leg. SMTP.

*Rhamphomyia umbripennis* Meigen, 1822. Very common and widespread, previous records are from Sk, Bl, Sm, Vg, Sö, Vs, Vr, Dr, Me, Hr, Jä, Ån, Vb, Ås, Ly and Pi. New records: 3♂, 3♀ **Bo**, Stenungsunds kommun, Kolhättan (Ödsmål),

Hällsberget, broad-leaved deciduous forest, Malaise trap, 58.140933°N, 11.856200°E (Trap ID 31), 14.iv–25.v.2004 (Coll. event 515). 8♂, 1♀ **Ha**, Kungsbacka kommun, Särö Västerskog, mid-northern part, oak and pine forest, Malaise trap, 57.505200°N, 11.925733°E (Trap ID 33), 2004.v.28–2004.v.14 (Coll. event 543), leg. SMTP. 6♂, 8♀ **Öl**, Mörbylånga, Lilla Vickleby Lunds NR, old oak forest, Malaise trap, Trap 65/2014, 17.v–27.vi.2014, leg. M. & C. Jaschhof.

## Hybotidae

*Anthalia schoenherri* Zetterstedt, 1838. Common species with broad range, reported from Nä, Vs, Ån, Vb, Nb, Ås and Ly. New records: 1♂ **Lu**, Jokkmokks kommun, Muddus nationalpark, southern parking, blueberry spruce forest, Malaise trap, 66.769533°N, 20.111383°E (Trap ID), 1–18.vi.2004 (Coll. event 699), leg. SMTP. 1♂, 1♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 2005.vi.05–2005.vi.18 (Coll. event 1385), leg. SMTP.

*Bicellaria simplicipes* (Zetterstedt, 1842). Known from Sk, Ha, Sm, Go, Ög, Up, Vb and Nb, but with large gaps between. New record: 1♀ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 1351), leg. SMTP.

*Bicellaria sulcata* (Zetterstedt, 1842). Similar distribution as of *B. simplicipes*, with scattered records from north to south; Sk, Öl, Nä, Ån, Vb, Nb, Ly and To. New records: 1♂, 1♀ **Sm**, Gränna kommun, Lönnemålen, norway spruce forest with big harvested ashes, Malaise trap, 58.048917°N, 14.573033°E (Trap ID 17), 28.iv–19.v.2004 (Coll. event 428), leg. SMTP. 11♂, 10♀ **Hr**, Härejadalens kommun, Sonfjället, Nyvallens fäbod, alpine birch and spruce forest, Malaise trap, 62.316683°N, 13.568555°E (Trap ID 42), 21.v–17.vi.2004 (Coll. event 650), leg. SMTP.

*Bicellaria vana* Collin, 1926. A very rare species in Sweden with records only from Sk, Öl and Up. New record: 1♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333, 16.286100°E (Trap ID 43), 15–29.vi.2005 (Coll. event 1907), leg. SMTP.

*Crossopalpus humilis* (Frey, 1913). A widespread species throughout Sweden, in Sk, Go, Nä, Sö, Up, Vs, Dr, Me, Ån, Vb, and Pi. New records: 2♂ **Sm**, Torsås Kommun, Söderåkra, Påboda, small village garden, Malaise trap, 56.434723°N, 16.070844°E (Trap ID 2046), 1.iv–1.v.2008 (Coll. event 2050), leg. SMTP. 1♀ **Sm**, Nybro kommun, Bäckebo, Grytsjöns nature reserve, old aspen in boulder terrain, Malaise trap, 56.921656°N, 16.101228°E (Trap ID 1000), 27.iv–18.v.2006 (Coll. event 1432), leg. SMTP. 1♀ **Öl**, Mörbylånga kommun, Gamla Skogsby (Kalkstad), meadow with shrub vegetation, Malaise trap, 56.616700°N, 16.507617°E (Trap ID 22), 1–25.iv.2005 (Coll. event 839), leg. SMTP.

*Crossopalpus minimus* (Meigen, 1838). This was recently reported as a new species for Sweden at ArtPortalen, from Vs. New record: 1♀ **Sö**, Huddinge kommun, Sofielunds återvinningsanläggning, garbage dump edge, Malaise trap, 59.176533°N, 17.993850°E (Trap ID 5), 3–18.v.2004 (Coll. event 352), leg. SMTP.

*Crossopalpus nigritellus* (Zetterstedt, 1842). Widespread with reports from Sk, Ha, Go, Bo, Sö, Up, Me and Vb. New record: 2♀ **Öl**, Mörbylånga kommun, Gamla Skogsby (Kalkstad), meadow with shrub vegetation, Malaise trap, 56.616700°N, 16.507617°E (Trap ID 22), 1–25.iv.2005 (Coll. event 839), leg. SMTP.

*Drapetis exilis* Meigen, 1822. Previously reported from Sk, Sm, Ög, Sö, Vs, Vr, Me, Ån, Vb, and Ås. New record: 1♀ **Go**, Gotlands kommun, Roleks, border between mixed pine forest and open grazed calcareous pasture, Malaise trap, 57.536783°N, 18.337883°E (Trap ID 28), 21.ix.2004–1.iv.2005 (Coll. event 1463), leg. SMTP.

*Drapetis incompleta* Collin, 1926. This species only has a few previous records, from Sk, Vg, Ög and Nä. New records: 9♂, 3♀ **Sm**, Torsås Kommun, Söderåkra, Påboda, small village garden, Malaise trap, 56.434723°N, 16.070844°E (Trap ID 2046), 1–15.vi.2008 (Coll. event 2052), leg. SMTP. 1♂ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 1351), leg. SMTP.

*Euthyneura albipennis* (Zetterstedt, 1842). Current records in Sweden only from Jä, Ån, Vb, Ås, Ly and Lu. It is here recorded considerably

more south than previous distribution records. New records: 1♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll. event 1385), leg. SMTP. 1♀ **Ög**, Ödeshögs kommun, Omberg, bokskogsreservatet (beech forest), Malaise trap, 58.297183, 14.634817°E (Trap ID 16), 28.v–5.vii.2005 (Coll. event 1666), leg. SMTP. 1♂ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 3051), leg. SMTP.

*Euthyneura gyllenhali* (Zetterstedt, 1838). Much broader range than *E. albipennis*. Occur from Sk in south, through Ha, Sm, Vs, Dr, Jä, Vb, Nb to Ås to Ly in north. However, records are fragmented. New records: 1♂ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 15–29.vi.2005 (Coll. event 1907), leg. SMTP. 1♀ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427648°N, 16.421110°E (Trap ID 3001), 15.v–9.vi.2014 (Coll. event 3050), leg. SMTP. 1♂ **Sm**, Nybro kommun, Alsterbro, Alsterån, mixed forest, Malaise trap, 56.936536°N, 15.920167°E (Trap ID 1008), 5–10.vi.2005 (Coll. event 1339), leg. SMTP.

*Euthyneura myrtilli* Macquart, 1836. This is the most common species in the genus in Sweden and previously not recorded from only Bl, Go, Vg, Ds, Nä, Sö, Gä and Hr. New record: 1♂ **Vg**, Laxå kommun, Finnerödja, Tottsjömo, border of marsh and fir forest, Malaise trap, 58.93126°N, 14.34652°E, 30.vi.2015–11.vii.2016, leg. E. Wahlberg.

*Leptopeza borealis* Zetterstedt, 1842. A widespread and common species, previously recorded in Sm, Ög, Dr, Me, Jä, Ån, Vb, Nb, Ås, Ly and Lu. New records: 7♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 29.vi–14.vii.2005 (Coll. event 1908), leg. SMTP. 1♂, 2♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll. event 1385), leg. SMTP.



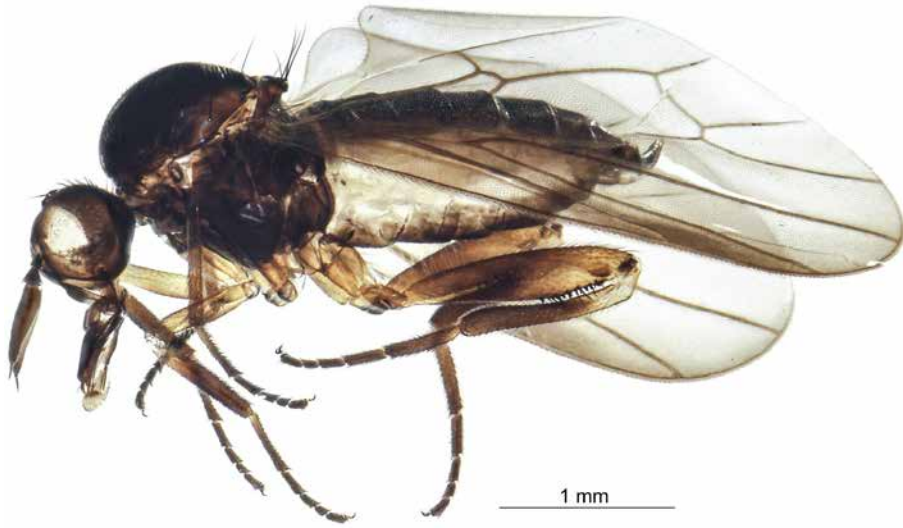


Figure 4. *Oedalea ringdahli* Chvála, 1983 (Hybotidae), female, lateral view. Image of a female specimen published for the first time, transparent appearance due to DNA extraction of whole specimen. Photo: Emma Wahlberg.

Figur 4. *Oedalea ringdahli* Chvála, 1983 (Hybotidae), hona, sidovy. Bild av en hona publicerad för första gången, genomskinligheten är orsakad av DNA-extrahering av hela individen. Foto: Emma Wahlberg.

*Leptopeza flavipes* (Meigen, 1820). Also a very common and widespread species, previously found everywhere except for Lu, Pi, Gä, Vr, Nä, Ds, Bo, Öl and Bl. New record: 2♂ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll. event 1385), leg. SMTP, 2♂.

*Ocydromia melanopleura* Loew, 1840. Known from Lu, Ly, Ås, Nb, Vb, Ån, Me, Up, Sö, Bo, Vg, Go, Sm, Ha and Sk. New record: 1♂ **Ög**, Ödeshögs kommun, Omberg, bokskogsreservatet (beech forest), Malaise trap, 58.297183°N, 14.634817°E (Trap ID 16), 28.v–5.vii.2005 (Coll. event 1666), leg. SMTP.

*Oedalea ringdahli* Chvála, 1983. As above a rare species, but also quite widespread with records from Sk, Sm, Ån, Vb, Ås and Ly. Chvála (1983) described the male and later Plant (1991) described the female only in text. The female is illustrated here for the first time (Fig. 4). New record: 1♀ **Vr**, Munkfors kommun, Ransäter, Ransberg Herrgård, Old mixed deciduous forest in stream ravine, Malaise trap, 59.790442°N, 13.415169°E (Trap ID 1003), 5–18.vi.2005 (Coll. event 1385), leg. SMTP.

*Oedalea stigmatella* Zetterstedt, 1842. This is the most common species in this genus and is reported from Sk, Ha, Sm, Go, Ög, Vg, Bo, Up, Vs, Vr, Gä, Me, Jä, Ån, Vb and Ås. New records: 1♂ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 29.vi–14.vii.2005 (Coll. event 1908), leg. SMTP. 1♀ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427648°N, 16.421110°E (Trap ID 3001), 15.v.2014–9.vi.2015 (Coll. event 3050), leg. SMTP.

*Oedalea zetterstedti* Collin, 1926. This species is uncommon but widespread according to Chvála (1983), where records were presented from To, Jä, Ha and Sk. Contemporary records exist also from Sm, Öl, Up, Vs, Ån, Vb and Ås. The records here confirm its widespread distribution. New records: 1♂, 11♀ **Ög**, Ödeshögs kommun, Omberg, Storpissan, old Norway spruce wood, Malaise trap, 58.334917°N, 14.655000°E (Trap ID 15), 5–19.vii.2005 (Coll. event 1660), leg. SMTP. 1♀ **Sö**, Huddinge kommun, Sofielund, garbage dump

– cadaver landfill, Malaise trap, 59.173100°N, 17.984750°E (Trap ID 2003), 9–29.vi.2006 (Coll. event 2033), leg. SMTP.

*Platypalpus albicornis* (Zetterstedt, 1842). *Platypalpus* is a large genus with ca 80 known species in Sweden. Many are small and difficult to determine to species, and the gap in knowledge of distribution and ecology is very likely large. *P. albicornis* is previously known from Sk, Go, Ög and Up. New record: 2♂, 2♀ **ÖI**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 1351), leg. SMTP.

*Platypalpus albiseta* (Panzer, 1806). A common and widespread species in Europe, but here confined to the southern half. Previous records from Sk, Ha, Go and Sö. A record from Vb exists in ArtPortalen. New record: 2♀ **Up**, Uppsala kommun, Fiby urskog, Trefaldighets källa, mixed deciduous forest along brook, Malaise trap, 59.883400°N, 17.193050°E (Trap ID 25), 29.vi–22.vii.2003 (Coll. event 450), leg. SMTP.

*Platypalpus boreoalpinus* Frey, 1943. This species is in Sweden confined to the northern parts, with records from Jä, Ån, Vb, Nb, Ås, Ly, Lu and To. New record: 2♂, 4♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 15–29.vi.2005 (Coll. event 1907), leg. SMTP.

*Platypalpus confinis* (Zetterstedt, 1842). A northern species, with one exception, known from Ög, Me, Jä, Ån, Vb, Nb, Ås, Ly, Lu and To. New record: 1♂ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 29.vi–14.vii.2005 (Coll. event 1908), leg. SMTP.

*Platypalpus cothurnatus* Macquart, 1827. Known records from Sk, Go, Ög, Nä, Sö, Up and Me. New record: 1♂, 1♀ **ÖI**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 1351), leg. SMTP.

*Platypalpus flavicornis* (Meigen, 1822). No contemporary records for this species exist, older records are from Sk, Go, Ög and Dr. New record: 2♀ **Sm**, Nybro kommun, Bäckebo, Grytsjöns nature

reserve, old aspen in boulder terrain, Malaise trap, °N, 56.921656, N16.101228°E (Trap ID 1000), 27.iv–18.v.2006 (Coll. event 1432), leg. SMTP.

*Platypalpus minutus* (Meigen, 1804). A very common species spread throughout Sweden, with records only lacking in Ds, Vs, Gä, and To. New record: 4♂, 2♀ **Vs**, Sala kommun, Västerfärnebo, Nötmyran (birches at Islingby, Östermyran), hay meadow, Malaise trap, 59.941959°N, 16.309450°E (Trap ID 11), 8–16.vi.2004 (Coll. event 418), leg. SMTP.

*Platypalpus stackelbergi* Kovalev, 1971. Rarely collected species only recorded from Me and Ån (Hellqvist 2013). Chvála (1983) noted the species as occurring in Russia, but later revised the distribution (Chvála 1989) and presented records from southern Finland and from Czechoslovakia. Possibly an overlooked species. New record: 1♀ **Up**, Håbo kommun, Biskops-Arnö, elm grove, northern beach, Malaise trap, 59.672133, 17.500850°E (Trap ID 8), 20.vi–18.vii.2005 (Coll. event 1602), leg. SMTP.

*Platypalpus zetterstedti* Chvála, 1971. Previously only recorded from Vr and To. New record: 1♂ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 29.vi–14.vii.2005 (Coll. event 1908), leg. SMTP.

*Symbollophthalmus dissimilis* (Fallén, 1815). This species occurs from Sk in south through Ha, Sm, Sö, Vr, Dr, Hä, Jä, Ån, Vb, Nb to Ly in north. New record: 1♂, 2♀ **Ög**, Ödeshögs kommun, Omberg, Storpissan, old Norway spruce wood, Malaise trap, 58.334917°N, 14.655000°E (Trap ID 1660), 5.vi–19.vii.2005 (Coll. event 1660), leg. SMTP.

*Tachypeza fuscipennis* (Fallén, 1815). Previously recorded from Sk, Sm, Ög, Sö, Up, Dr, Jä, Vb, Nb, Ås, Ly, Pi, Lu and To. New record: 1♀ **ÖI**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427648°N, 16.421110°E (Trap ID 3001), 15.v.2014–9.vi.2015 (Coll. event 3050), leg. SMTP.

*Tachypeza heeri* Zetterstedt, 1838. Distribution concentrated in northern provinces Bo, Dr, Me, Hr, Jä, Ån, Vb, Nb, Ås, Ly, Ly and To. New record: 1♀ **Vs**, Färna Ecopark, 200 m E Lake Lilla Kedjen, 4 km NE Västergården, 94 masl, Malaise trap, 58.833333°N, 15.89706°E (Loc#F002:01), 13–21.vi.2011, leg. KA Johanson.

*Tachypeza truncorum* (Fallén, 1815). Widespread as above but not as common. Sk, Bl, Sm, Sö, Up, Gä, Me, Ån, Vb, Nb, Jä, Ås, Ly, Lu and To. . New record: 2♂, 2♀ **Hs**, Hudiksvalls kommun, Stensjön-Lomtjärn, Stensjön, marsh pine forest close to bog, Malaise trap, 62.140333°N, 16.286100°E (Trap ID 43), 29.vi–14.vii.2005 (Coll. event 1908), leg. SMTP.

*Trichina elongata* Haliday, 1833. Previous records are from Sk, Sm, Bo, Up, Hä, Me, Jä, Ån, Vb, Nb, Ås, Ly and Pi. New records: 1♀ **Ög**, Ödeshögs kommun, Omberg, bokskogsreservatet (beech forest), Malaise trap, 58.297183°N, 14.634817°E (Trap ID 16), 28.v–5.vii.2005 (Coll. event 1666), leg. SMTP. 4♀ **Öl**, Mörbylånga kommun, Västerstads almlunds naturreservat, old elm forest, Malaise trap, 56.427307°N, 16.421942°E (Trap ID 3002), 15.v–9.vi.2014 (Coll. event 1351), leg. SMTP.

*Trichina pallipes* (Zetterstedt, 1838). Widespread species with records from Sm, Go, Nä, Sö, Vr, Vb and Nb. New record: 1♂ **Up**, Knivsta kommun, Rickebastas alsumpskog, western part, alder swamp wood, Malaise trap, 59.734350°N, 17.720417°E (Trap ID 9), 18.vi–6.vii.2003 (Coll. event 355), leg. SMTP.

*Trichinomyia flavipes* (Meigen, 1830). Previously known from Sk, Ha, Sm, Öl, Vg, Sö, Up, Dr, Hä, Me and Ån. New record: 1♂, 2♀ **Go**, Gotlands kommun, Roleks, border between mixed pine forest and open grazed calcareous pasture, Malaise trap, 57.536783°N, 18.337883°E (Trap ID 28), 21.ix.2004–1.iv.2005 (Coll. event 1463), leg. SMTP.

## Ragadidae

*Iteaphila furcata* (Zetterstedt, 1842). Few records exist for this species in Sweden. Previous records are from Ög, Dr, Ån, Nb, Vb and Ås. New record: 1♀ **Hr**, Härejdalens kommun, Sånfjället, Nyvallens fåbod, alpine birch and spruce forest, Malaise trap, 62.316683, 13.568555°E (Trap ID 42), 21.v–17.vi.2004 (Coll. event 650), leg. SMTP.

*Iteaphila nitidula* Zetterstedt, 1838. Also a rarely recorded species, a few records exist from Dm, Dr, Vb, Nb, Ås and To. New record: 1♂, 1♀ **Ög**, Ödeshögs kommun, Omberg, Storpissan, old Norway spruce forest, Malaise trap, 58.334917°N, 14.655000°E (Trap ID 15), 3.iii–28.v.2005 (Coll. event 1658), leg. SMTP.

## Conclusions

The new records presented above are in some cases expected, such as gaps between northern and southern Sweden being filled and widespread species confirmed. Some are, however, unexpected, with clear range expansions. Most notable are those new to Sweden, where all except for *Rhamphomyia lamellata* are previously only known from south of Scandinavia. Milan Chvála worked thoroughly with extensive material collected in Skåne and Denmark, and it is therefore plausible that these new species records are due to recent migration into Sweden.

Most of the material that this report is based on is from the Swedish Malaise Trap Project, but only a part of this material was included in this study. As much material from that project is still to be examined, additional records from it will possibly be reported in the future. Furthermore, many species are ground dwelling, riparian or semi aquatic, leading to their entrapment in Malaise traps less obvious. Individuals avoiding Malaise traps have been indirectly observed during the sorting of the material, as some species are clearly underrepresented or completely absent in the material. One example of such group is Clinocerine, a subfamily within Empididae with species associated with freshwater streams and often used as biological indicators. Additional collection methods as well as novel molecular and analytical methods, for example environmental DNA, may provide an even broader picture of the Swedish empidoid fauna.

Modern molecular methods for identification are however hampered by the lack of taxonomical representation in reference databases, such as BOLD. There are still over 200 species of Empididae and Hybotidae known from Sweden that are not bar-coded, over half of the known fauna. The urgency for giving priority to closing this gap is still apparent. An endeavour that requires both taxonomical and morphological expertise, as well as knowledge of molecular methods.

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## References

- Chvála, M. 1983. The Empidoidea (Diptera) of Fennoscandia and Denmark, part II: General part. The families Hybotidae, Atelestidae and Microphoridae. – In: Andersen, N.M., Hedqvist, K.-J., Kauri, H., Krogerus, H., Lyneborg, L., Schmidt Nielsen, N., & Silfverberg, H. (eds). Fauna entomologica Scandinavica. Vol. 12. Scandinavian Science Press Ltd, Vinderup.
- Chvála, M. 1989. Monograph of northern and central European species of *Platypalpus* (Diptera, Hybotidae), with data on the occurrence in Czechoslovakia. – Acta Universitatis Carolinae: Biologica 32: 209–376.
- Dyntaxa 2019. Swedish Taxonomic Database. <https://www.dyntaxa.se>
- Folmer, O., Hoeh, W.R., Black, M.B. & Vrijenhoek, R.C. 1994. Conserved primers for PCR amplification of mitochondrial DNA from different invertebrate phyla. – Molecular Marine Biology and Biotechnology 3: 294–299.
- Hebert, P.D.N., Cywinska, A., Ball, S.L. & deWaard, J.R. 2003. Biological identifications through DNA barcodes. – Proceedings of the Royal Society of London. Series B: Biological Sciences 270: 313–321.
- Hellqvist, S. 2013. Nytt i den svenska fluglistan från norra Sverige. – Entomologisk Tidskrift 134: 111–119.
- Jonassen, T. 1992. Further Empidoidea (Dipt.) new to the Norwegian fauna. – Fauna Norvegica Series B 39: 73–75.
- Karlsson, D., Pape, T., Johanson, K.A., Liljeblad, J. & Ronquist, F. 2005. The Swedish Malaise Trap Project, or how many species of Hymenoptera and Diptera are there in Sweden? – Entomologisk Tidskrift 126: 43–53.
- Kearse, M., Moir, R., Wilson, A., Stones-Havas, S., Cheung, M. & Sturrock, S. 2012. Geneious Basic: an integrated and extendable desktop software platform for the organization and analysis of sequence data. – Bioinformatics 28: 1647–1649.
- Madden, T. 2013. The BLAST Sequence Analysis Tool. The NCBI Handbook. 2nd edition. National Center for Biotechnology Information, Bethesda.
- Moulton, J.K. & Wiegmann, B.M. 2007. The phylogenetic relationships of flies in the superfamily Empidoidea (Insecta: Diptera). – Molecular Phylogenetics and Evolution 43: 701–713.
- Orford, K.A., Vaughan, I.P. & Memmott, J. 2015. The forgotten flies: the importance of non-syrphid Diptera as pollinators. – Proceedings of the Royal Society of London B: Biological Sciences 282: 20142934.
- Pape, T., Blagoderov, V. & Mostovski, M.B. 2011. Order Diptera Linnaeus, 1758. – In: Zhang, Z.-Q. (ed.), Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. – Zootaxa 3148: 222–229.
- Plant, A. 1991. *Oeadalea ringdahli* Chvála (Diptera: Hybotidae) In Britain. – British Journal of Entomology and Natural History 4: 183.
- Ratnasingham, S. & Hebert, P. D. N. 2007. BOLD: The Barcode of Life Data System ([www.barcodinglife.org](http://www.barcodinglife.org)). – Molecular Ecology Notes 7: 355–364.
- Sinclair, B.J. & Cumming, J.M. 2006. The morphology, higher-level phylogeny and classification of the Empidoidea (Diptera). – Zootaxa 1180: 1–172.
- Sweeney, B.W., Battle, J.M., Jackson, J.K., & Dapkey, T. 2011. Can DNA barcodes of stream macroinvertebrates improve descriptions of community structure and water quality? – Journal of the North American Benthological Society 30: 195–216.
- Wahlberg, E. & Johanson, K.A. 2018. Molecular phylogenetics reveals novel relationships within Empidoidea (Diptera). – Systematic Entomology 43: 619–636.

## Sammanfattning

Tre arter noteras som nya för Sverige, *Rhampomyia erythrophthalma* Meigen, 1830, *R. lamellata* Collin, 1926, och *Platypalpus pygialis* Chvála, 1973, och nya provinsfynd presenteras för ytterligare flertalet arter från både Hybotidae och Empididae. Vi tillgängliggör även streckkoder från 71 arter, som alla är skickade till Barcode of Life Database tillsammans med geografiska data och fotografier av tillhörande exemplar. Detta ökar den taxonomiska representationen i databasen med över 30%. Ett välkommet tillskott som bidrar till nya molekylära metoder, som kräver hög täckning av kvalitetssäkrade referensdata. Dessutom kan en bild på honan av puckeldansflugan *Oeadalea ringdahli* Chvála, 1983 för första gången publiceras.