

The tribe Meteorini (Hymenoptera, Braconidae, Euphorinae) in Norway, with additional information on host associations

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The tribe Meteorini comprises the two genera *Meteorus* Haliday, 1835 and *Zelev* Curtis, 1832, and materials of these genera has been examined in the collections of the Natural History Museum in Oslo. Nine species not previously reported from Norway were found, i.e. *Meteorus affinis* (Wesmael, 1835), *M. alborossicus* Lobodenko, 2000, *M. consimilis* (Nees, 1834), *M. limbatus* Maeto, 1988, *M. lionotus* Thomson, 1895, *M. obfuscatus* (Nees, 1811), *M. ruficeps* (Nees, 1834), *M. tabidus* (Wesmael, 1835) and *Zelev annulicrus* (Thomson, 1895). This brings the number of *Meteorus* to 23 and *Zelev* to 5 in Norway. All European species of *Zelev* have now been recorded in Norway. Several new county records are also presented, including records of *M. cespitator* (Thunberg, 1824), which was previously recorded from Norway but without any further data on localities. Biology and distribution for each species are briefly discussed. For several species additional information on host association is given.

Key words: Braconidae, Euphorinae, Meteorini, *Meteorus*, *Zelev*, new records, host associations, Norway.

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Introduction

The Braconidae represents one of the major families of parasitoid Hymenoptera (Achterberg 1984). Despite their abundance and economic importance, they have not been well studied worldwide, including Norway. Previous publications on Norwegian Braconidae have reported less than 200 species from Norway (i.e. Strand 1898, 1906, 1919, Achterberg 1974, Riedel *et al.* 2002). In fact, no comprehensive faunistic survey of Norwegian braconids has been compiled so far. One sole attempt was by Strand (1898), but the list counted only 18 species. In Britain, the number

of species of Braconidae counts around 1200, representing almost 20% of all Hymenoptera known from there (Shaw & Huddleston 1991). Gärdenfors *et al.* (2003) gave an estimate of 1136 species for Sweden. There is no reason to believe that the number would be substantially lower in Norway. However Ottesen (1993) estimated the number in Norway to be 700, which is probably far too low.

The tribe Meteorini includes only two genera, *Meteorus* Haliday, 1835 and *Zelev* Curtis, 1832, which are koinobiont endoparasitoids of Lepidoptera and Coleoptera larvae. More than 300 species are known worldwide, about one fifth

occurring in the Western Palearctic (Stigenberg & Ronquist 2011). Shaw (1994) thoroughly summarised the main objections regarding literature records of hosts: unrepresentative data from simplified environments and from single sites, unquantitative host records presented in accumulated data, numerous misidentifications of parasitoids and uncontrolled rearings. Most host records given here are from secondary literature sources, namely Yu *et al.* (2012) and Stigenberg & Ronquist (2011), and should be viewed with skepticism and care (Shaw 1994). New host data as well as phenology and distribution from controlled rearings of the Meteorini in the collections of the National Museums of Scotland, by Stigenberg & Shaw, are currently in press. The aim of this paper is to give an update of the Meteorini in Norway, as part of a future checklist of Norwegian braconids, and to describe the holdings at the Natural History Museum of Oslo.

Material and methods

Only pinned material in the collection of the Natural History Museum of Oslo is revised in this study. Information about biology and world distribution is extracted from Stigenberg & Ronquist (2011) and Yu *et al.* (2012), while older data about distribution in Norway is taken from Huddleston (1980) and Riedel *et al.* (2002) if nothing else is stated. For global distribution, only occurrences in continents and in the Nordic countries are given. The faunistic divisions within Norway are defined in accordance with Økland (1981), and are given in bold. The «European Invertebrate System» (EIS) follows Endrestøl (2005), and the coordinates given refer to the «Military Grid Reference System» (MGRS) and World Geodetic System 84 (WGS84). The taxonomy follows Stigenberg & Ronquist (2011). For reared material, both order and family affiliations of the hosts are given in the list. All records refer to fully labeled specimens deposited in the collections at the Natural History Museum of Oslo.

Material in Natural History Museum of Oslo

Meteorus abdominator (Nees, 1811)

Material examined: Ø, Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 20 September 1996, leg. Ove Sørlibråten; **AK**, Oslo: Maridalen, Dausjøen N [EIS 36; 32V 19 July–26 August 2002 ± 50m] 1♀ Malaise-trap / outlet, leg. Kjell Magne Olsen & Sigve Reiso; Asker: Skustadfossen, Solstad [EIS 28; 32V NM 8208 3754 ±25m] 1♀ 1 August–11 September 2009 Malaise-trap / *Ulmus glabra* / river-shore, leg. Eirik Rindal & Geir Söli; **ON**, Nordre Land: Austsinni [EIS 46; 32V NN 5733 4650 ±50m] 1♀ 27 July–1 August 2009 yellow pan-trap / gravel-pit, leg. Lars Ove Hansen & Eirik Rindal; **BØ**, Modum: Morud E [EIS 35; 32V NM 4782 5857 ±50m] 1♀ 1 August 2009 sweep-netted / meadow / sandy pine forest, leg. Lars Ove Hansen; Kongsberg: Kongsgårdsmoen, Skrimsetta [EIS 27; 32V NM 3616 0974 ±50m] 1♂ 22–27 July 2008 yellow pan-trap, leg. Lars Ove Hansen; **AAY**, Birkenes: Birkeland, Nordåsen [EIS 6; 32V MK 5549 6608 ±50m] 1♀ 1–30 June 2006, 3♀♀ 1♂ 1–31 July 2006 Malaise-trap, leg. Svein Svendsen; Lillesand: Lillesand, Furulia [EIS 6; 40m a.s.l.; 32V MK 6236 5586 ±25m] 1♀ 1–31 July 2004 Malaise-trap / south-facing slope, leg. Gunnar Wiig.

Biology: Parasitizes Lepidoptera, mostly Geometridae.

Distribution: Europe: Denmark, Finland, Sweden and Norway; Asia. **Norway:** **BV** Ål (Strand 1906); **Ø** Sarpsborg, Rygge; **BØ** Drammen, Røyken, **VE** Re [Våle], **TEI** Notodden.

Meteorus abscissus Thomson, 1895

Material examined: **BØ**, Hurum: Østnes-tangen [EIS 19; 32V NL 8532 9970 ±50m] 7♀♀ 3♂♂ 8 July–20 August 1995 Malaise-trap / pine-forest, leg. Lars Ove Hansen; **VE**, Tjøme: Sandø N [EIS 19; 32V NL 8385 5029 ±50m] 1♀ 14 June–20 July 2007 pit-fall trap / sandy beach / pine forest, leg. Lars Ove Hansen.

Biology: Parasitizes Lepidoptera, in particular Geometridae and Noctuidae; preferably in arid, exposed environments. The present record from Tjøme is from an arid sandy locality.

Distribution: Europe: Sweden and Norway; **Norway:** «Norway». Asia. **Norway:** Ø Rygge.

***Meteorus affinis* (Wesmael, 1835)**

Material examined: **BØ**, Nedre-Eiker: Ryggsetra [EIS 28; 32V NM 5879 2214 ±25m], 1♀ 1–31 July 1994 Malaise-trap A / hay-meadow, leg. Yngvar Berg & Lars Ove Hansen; **AAV**, Arendal: Tromøy [EIS 6; 32V MK 92252 81059 ±25m] 1♀ ex *Infurcitinea argentimaculella* (Stainton, 1849) (Lepidoptera, Tineidae), larva collected 6 April 2007 on *Lepraria* sp. (Lecanorales: Stereocaulaceae), leg. Ove Sørlibråten; **FV**, Alta: Kåfjord, Møllernes [EIS 173; 34W EC 7875 6166 ±100m] 2♀♀ 4 August–25. September 1996 Malaise-trap / south-facing slope, leg. Lars Ove Hansen & Helge Rinden.

Biology: Solitary endoparasitoid that is attracted to light. Most host records involve the lepidopteran family Psychidae. Here a specimen reared from *Infurcitinea argentimaculella* (Stainton, 1849) (Lepidoptera, Tineidae) is reported.

Distribution: Europe: Finland, Sweden and Norway (i.e. only this study). Asia; not previously recorded from Norway.

***Meteorus alborossicus* Lobodenko, 2000**

Material examined: **AK**, Ås: Vollebekk [EIS 28; 32V NM 9865 1509 ±100m] 1♂ ex *Picea abies* infested with *Sirex* sp. November 1959 [probably the emergence date] (Hymenoptera: Siricidae), leg. Alf Bakke.

Biology: The species has been reared from wet stumps in a study on saproxylic insects at the Swedish University of Agricultural Sciences.

Distribution: Europe: Belarus, Sweden and UK; not previously recorded from Norway.

***Meteorus cespitator* (Thunberg, 1822)**

Material examined: **OS**, Gran: Knarud [EIS 36; 32V NM 8104 9115 ±500m] 1♀ 17 July 1968, leg. Morten Falck; **TRY**, Tromsø: Kvaløy, Håkøybotn [EIS 162; 34W DC 1154 2625 ±1000m] 1♀ 19 July 2001, leg. Ove Sørlibråten.

Biology: Parasitizes Tineidae (Lepidoptera); attracted to light.

Distribution: Europe: Denmark, Finland, Sweden, Norway and Iceland; Asia; Australia.

***Meteorus cinctellus* (Spinola, 1808)**

Material examined: **AK**, Oslo: Hovedøya SE, «Kommandantboligen» [EIS 28; 32V NM 9696 4070 ±25m] 3♀♀ 29 June–21 July 2005 Malaise-trap, leg. Øivind Gammelmo & Ole Jørgen Lønnve; Oslo: Bygdøy, Rodeløkken [EIS 28; 32V NM 9451 4315 ±25m] 1♀ 27 June–25 July 2005 Malaise-trap / slope, leg. Anders Endrestøl & Stefan Olberg; Oslo: Lindøya [EIS 28; 32V NM 9598 4048 ±50m] 1♀ 1–19 June 2006 Malaise-trap / meadow / forest edge, leg. Anders Endrestøl; Sørum: Blaker, Sandum [EIS 29; 32V PM 3319 4959 ±100m] 1♀ 4 June 2008, leg. Ove Sørlibråten; **BØ**, Hurum: Mølen NW [EIS 19; 32V NL 8492 9548 ±10m], 3♀♀ 17 June–10 July 2010 Malaise-trap / sandy beach, leg. Lars Ove Hansen; Hurum: Ramvikholmen [EIS 19; 32V NL 8674 9873 ±5m], 1♀ 17 June–10 July 2010 Malaise-trap / old lime forest, leg. Lars Ove Hansen; **AAV**, Birkenes: Birkeland, Nordåsen [EIS 6; 32V MK 5549 6608 ±50m] 1♀ 1–30 June 2006, Malaise-trap, leg. Svein Svendsen.

Biology: Parasitizes Tortricidae (Lepidoptera).

Distribution: Europe: Denmark, Finland, Sweden and Norway; Asia;. **Norway:** **BV** Ål (Strand 1906); **HEN** Rendalen and **VE** Re [Våle].

***Meteorus colon* (Haliday, 1835)**

Material examined: **AK**, Ullensaker: Sessvollmoen W [EIS 37; 204m.a.s.l.; 32V PM 1777 8051 ±25m] 1♂ 11–26 June 2007 Malaise-trap [B] / sandy pine-forest, leg. Lars Ove Hansen; Bærum: Kjaglidalen [EIS 28; 32V NM 7906 4698 ±100m] 1♀ 25 June 1996, leg. Ove Sørlibråten; **HES**, Kongsvinger: Abborhøgda [EIS 38; 33V UG 5912 7465 ±25m] 1♂ 10 August–6 September 2003 Malaise-trap / slope, leg. Lars Ove Hansen & Karsten Sund; **RI**, Suldal: Sand, Eide [EIS 24; 32V LL 4485 9865 ±100m] 1♀ 1–31 July 2004 light-trap, leg. Kai Berggren & Reidar Voith.

Biology: Parasitizes different families of Lepidoptera, mainly Noctuidae.

Distribution: Europe: Denmark, Finland, Norway, Sweden. **Norway:** **AK** Bærum.

***Meteorus consimilis* (Nees, 1834)**

Material examined: Ø, Hvaler: Ørekroken [EIS 12; 32V PL 1537 4553 ±25m] 2♂♂ 15 August–30 September 2003 Malaise-trap [A] / sandy shore / open pine forest, leg. Lars Ove Hansen; HES, Kongsvinger: Abborhøgda [EIS 38; 33V UG 5912 7465 ±25m] 1♂ 10 August–6 September 2003 Malaise-trap / slope, leg. Lars Ove Hansen & Karsten Sund.

Biology: Parasitizes *Scolytus multistriatus* (Coleoptera: Scolytinae).

Distribution: Europe: Denmark, Finland, Sweden; Asia: not previously recorded from Norway.

***Meteorus filator* (Haliday, 1835)**

Material examined: AK, Oslo: Ekebergskråningen NW [EIS 28; 32V NM 9845 4093 ±25m] 2♀♀ 9 May–17 June 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl; Sørurum: Lørenfallet, Egner [EIS 37; 32V PM 2571 6100 ±500m] 1♀ 18 September 1996, leg. Ove Sørlibråten; VAI, Audnedal: Viblemo [EIS 5; 32V MK 0365 5855 ±250m] 1♀ 1–31 August 2000 light-trap, leg. Kai Berggren; STI, Skaun: Lundneset [EIS 92; 32V NR 5182 2490 ±500m] 1♀ 13 September 1978, leg. Henrik W. Walden.

Biology: Emerged from a bracket fungus, *Trametes versicolor* (Polyporales: Polyporaceae).

Distribution: Europe: Denmark, Finland, Norway, Sweden. **Norway:** «Norway»; Ø Rygge.

***Meteorus hirsutipes* Huddleston, 1980**

Material examined: Ø, Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♂ 7 August 1998, leg. Ove Sørlibråten; AK, Oslo: Bygdø, Hengsenga [EIS 28; 32V NM 9347 4318 ±25m] 1♀ 25 June–8 August 2007 Malaise-trap, leg. Anders Endrestøl; Oslo: Hovedøya SE, «Kommandantboligen» [EIS 28; 32V NM 9696 4070 ±25m] 1♀ 21 July–26 August 2005 Malaise-trap, leg. Øivind Gammelmo & Ole Jørgen Lønnve; Oslo: Maridalen, Kirkeby NW [EIS 36; 32V NM 9817 5231 ±25m] 1♀ 31 July–13 December 2007 Malaise-trap / by small stream, leg. Anders Endrestøl & Lars Ove Hansen; Ullensaker: Sessvollmoen W [EIS 36; 32V PM 1780 8054 ±25m] 2♀♀ 26 June–25

August 2007 Malaise-trap [A] / sandy pine-forest, leg. Lars Ove Hansen; Ullensaker: Aurtjernet [W], Sessvollmoen [EIS 37; 200m.a.s.l.; 32V PM 1722 7907 ±25m] 1♀ 26 June–25 August 2007 Malaise-trap [C] / sandy pine-forest, leg. Lars Ove Hansen; ON, Vestre Slidre: Vaset, Vaset centre [EIS 52; 32V MN 9985 6285 ±100m] 1♀ reared from *Inonotus obliquus* (Ach. ex Pers.) Pilát (Hymenochaetales: Hymenochaetaceae) collected 2 May 1998, infested with *Nemapogon picarella* (Clerck, 1759) [78 specimens emerged] and *Triaxomera fulvimitrella* (Sodoffsky, 1830) [1 specimen emerged] (Lepidoptera, Tineidae), leg. Ove Sørlibråten; RI, Suldal: Sand, Eide [EIS 24; 32V LL 4485 9865 ±100m] 4♀♀ 1–31 July 2004, 1♀ 1–31 August 2004 all light-trap, leg. Kai Berggren & Reidar Voith.

Biology: Reared from the fungus *Inonotus obliquus* Pilát (Hymenochaetales: Hymenochaetaceae) infested with *Nemapogon picarella* (Clerck, 1759) and *Triaxomera fulvimitrella* (Sodoffsky, 1830) (Lepidoptera, Tineidae).

Distribution: Europe: Finland, Sweden and Norway; Asia. **Norway:** BØ Røyken.

***Meteorus ictericus* (Nees, 1811)**

Material examined: Ø, Hvaler: Asmaløy, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 7 August 1998, leg. Ove Sørlibråten; Rygge: Ekeby [EIS 12; 32V 32V NL 9489 8440 ±100m] 1♂ 22 July 1998, leg. Ove Sørlibråten; AK, Oslo: Ekebergskråningen NW [EIS 28; 32V NM 9845 4093 ±25m] 1♀ 9 May–17 June 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl; Oslo: Hovedøya NE, «Kong Sverres utsikt» [EIS 28; 32V NM 9739 4103 ±25m] 1♀ 29 June–21 July 2005 Malaise-trap / slope, leg. Øivind Gammelmo & Ole Jørgen Lønnve; Oslo: Lindøya [EIS 28; 32V NM 9598 4048 ±50m] 1♀ 1–19 June 2006 Malaise-trap / meadow / forest edge, leg. Anders Endrestøl; Frogn: Frogn church, Danmark [EIS 28; 32V NM 9690 1867 ±50m] 1♀ 21 August–11 December 2004 Malaise-trap / oak grove, leg. Lars Ove Hansen & Eirik Rindal; Lørenskog: Losbydalen, Møllerenga [EIS 29; 32V PM 1131 4007 ±100m] 1♀ 5 September 1997, leg. Ove Sørlibråten; Ås: Ås [EIS 28; 32V NM 9865 1509 ±500m] 1♀ emerged 20 July 1968 [in lab.]

from *Pandemis* sp. (Lepidoptera, Tortricidae) on *Malus domestica* Borkh., collected 10 July 1968, leg. Roar Ihlebæk; **ON**, Vang: Vangsmjøse, Leine [EIS 52; 32V MN 7465 8055 ±250m] 2♀♀ 1–30 September 2004, 2♀♀ 1–31 October 2004, all light-trap, leg. Kai Berggren; **AAY**, Birkenes: Birkeland, Nordåsen [EIS 6; 32V MK 5549 6608 ±50m] 2♀♀ 1–30 September 2002, 3♀♀ 1♂ 1–31 July 2006 Malaise-trap, leg. Svein Svendsen.

Biology: Associated with many families of Lepidoptera, especially Tortricidae; readily attracted to light.

Distribution: Europe: Denmark, Finland, Norway and Sweden; Asia; N America; Australia. **Norway:** **HOY** Bergen (Strand 1919), **Ø** Fredrikstad; **AK** Ås.

Meteorus jaculator (Haliday, 1835)

Material examined: **AK**, Asker: Skustad-fossen, Solstad [EIS 28; 32V NM 8208 3754 ±25m] 1♀ 1 August–11 September 2009 Malaise-trap / *Ulmus glabra* / river-shore; leg. Eirik Rindal & Geir Söli.

Biology: Recorded from Gelechiidae, Psychidae and Tineidae (Lepidoptera); predominantly in deciduous forests.

Distribution: Europe: Denmark, Finland, Sweden and Norway. **Norway:** **Ø** Rygge, **VE** Re [Våle].

Meteorus limbatus Maeto, 1988

Material examined: **AK**, Oslo: Ekeberg-skråningen NW [EIS 28; 32V NM 9845 4093 ±25m] 1♀ 9 May–17 June 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl.

Biology: Very little information available.

Distribution: Europe: Sweden and Norway; Asia; not previously recorded from Norway.

Meteorus lionotus Thomson, 1895

Material examined: **AK**, Oslo: Ekeberg-skråningen SE [EIS 28; 32V NM 9891 4023 ±10m] 1♀ 19 August–22 October 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl; **BØ**, Ringerike: Oppkuven [EIS 36; 32V NM 8501 6169 ±1000m] 1♀ 2–9 September 1996 at light, leg. Alf Bakke, Torstein Kvamme & Leif Aarvik; **VAY**, Kristiansand: Flekkerøy, Beltevigga [EIS 2;

32V 3985 3655 ±100m] 4♂♂ 1–31 July 2001 at light, leg. Kai Berggren.

Biology: Parasitoid of Geometridae.

Distribution: Europe: Sweden, Finland and Norway; Asia; not previously recorded from Norway.

Meteorus obfuscatus (Nees, 1811)

Material examined: **ON**, Vestre Slidre: Vaset, Vaset centre [EIS 52; 32V MN 9985 6285 ±100m] 3♂♂ emerged from *Inonotus obliquus* (Ach. ex Pers.) Pilát (Hymenochaetales, Hymenochaetaceae) collected 2 May 1998, infested with *Nemapogon picarella* (Clerck, 1759) [78 specimens emerged] and *Triaxomera fulvimitrella* (Sodoffsky, 1830) [1 specimen emerged] (Lepidoptera, Tineidae), leg. Ove Sørli-bråten.

Biology: Host records are present from Cerambycidae, Erotylidae, Melandryidae and Tenebrionidae (Coleoptera).

Distribution: Europe: Finland and Sweden; not previously recorded from Norway.

Meteorus oculatus Ruthe, 1862

Material examined: No material present in the collections at the Natural History Museum of Oslo.

Biology: Recorded from *Taleporia tubulosa* (Lepidoptera, Psychidae).

Distribution: Europe: Finland, Sweden and Norway; Asia. **Norway:** **Ø** Sarpsborg.

Meteorus pendulus (Muller, 1776)

[Syn.: *M. gyrator* (Thunberg, 1824), *M. scutellator* (Nees, 1834)]

Material examined: **Ø**, Hvaler: Asmaløy, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 20 September 1996, leg. Ove Sørli-bråten; Oslo: Østensjøvannet, Abildsø [EIS 28; 32V PM 0181 4029 ±10m] 6♂♂, 1–31 August 1996 Malaise-trap / meadow leg. Morten Falck; Sørum: Lørenfallet, Egner [EIS 37; 32V PM 2571 6100 ±500m] 2♀♀ 18 September 1996, 1♀ 26 September 1996, leg. Ove Sørli-bråten; Ullensaker: Holtmarka, Holtsætra [EIS 37; 32V PM 2805 6239 ±250m] 3♀♀1♂ 18 October 1996, 1♀ 19 October 1996, leg. Ove Sørli-bråten; Lørenskog:

Losbydalen, Møllerenga [EIS 29; 32V PM 1131 4007 ±100m] 1♀ 5 September 1997, leg. Ove Sørlibråten; Bærum: Oksenøya, Oksenøyveien 71 [EIS 28; 32V NM 8993 4133 ±50m] 1♀ 1 July–15 August 2002 Malaise-trap / calcareous meadow, leg. Lars Ove Hansen, Asker: Nesøya, Storenga [EIS 28; 32V NM 8627 3793 ±25m] 1♂ May–July 2003, 1♂ August–November 2003 Malaise-trap / meadow [loc. E], leg. Lars Ove Hansen; **ON**, Vestre Slidre: Olberg, Frikstad [EIS 52; 32V MN 9745 7335 ±100m] 1♀ 13 October 1996, leg. Ove Sørlibråten; Vang: Vangsmjøse, Leine [EIS 52; 32V MN 7465 8055 ±250m] 2♀♀ 1–31 October 2004, light-trap, leg. Kai Berggren; **BØ**, Drammen: Underlia [EIS 28; 32V NM 6612 2477 ±25m] 1♂ 1–31 August 1995 Malaise-trap, leg. Lars Ove Hansen; **TEI**, Sauherad: Sauherad prestegård [EIS 18; 32V NL 1593 8688 ±500m] 1♀ 12 September 1971, leg. Torgeir Edland; **VAY**, Kristiansand: Nedre Timenes [EIS 2; 32V MK 4705 4705 ±100m] 1♀ 1–31 October 2001 at light, leg. Kai Berggren; **HOI**, Ullensvang: Sekse [EIS 32; 32V LM 6821 8207 ±1000m] 1♂ + larva / cocoon *Eupsilia transversa* (Lepidoptera, Noctuidae) on *Malus domestica* picked 2 June 1980, reared 30 June 1980 [in lab.; ref.15/80], leg. Torgeir Edland; **MRY**, Gjemnes: Batnfjord, Knutset [EIS 84; 32V MQ 3595 7935 ±100m] 1♀ 20 August 2009, leg. Halvard Hatlen; **NNV**, Hadsel: Austvågøy, Myrlandsøya [EIS 138; 33W WR 0076 9412 ±200m] 1♂ 14 August 2002, leg. Morten Falck.

Biology: Host records are from several families of Lepidoptera, including Geometridae, Lasiocampidae, Lycaenidae, Lymantriidae, Noctuidae and Tortricidae.

Distribution: Europe: Denmark, Finland, Sweden and Norway; Asia. **Norway:** **NSI** Hattfjelldal as *M. scutellator* (Strand 1906); **Ø** Sarpsborg, Rygge, and **BØ** Røyken as *M. gyrator*.

Meteorus pulchricornis Wesmael, 1835

Material examined: **VAY**, Kristiansand: Flekkerøy, Belteviga [EIS 2; 32V 3985 3655 ±100m] 1♀ 1–31 July 2001 at light, leg. Kai Berggren.

Biology: Parasitizes especially Noctuidae, although there are records from 17 other families

of Lepidoptera.

Distribution: Europe: Denmark, Sweden and Norway; Asia; N and S America; Australia. **Norway:** **BØ** Røyken.

Meteorus rubens (Nees, 1811)

Material examined: **Ø**, Hvaler: Ørekroken [EIS 12; 32V PL 1537 4553 ±25m] 1♀ 15 August–30 September 2003 Malaise-trap [A] / sandy shore / open pine forest, leg. Lars Ove Hansen; Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♂ 9 May 2008 sweep-netted / gravel-pit, leg. Ove Sørlibråten; **HES**, Elverum: Starmoen NR [EIS 46; 32V PN 4607 4912 ±25m] 1♀ 11 June–29 July. 2004, 1♀ 29 July–14 September 2004, Malaise-trap [N] / sandy pine forest, leg. Lars Ove Hansen & Eirik Rindal; **HEN**, Rendalen: Solbakken [EIS 64; 32V PP 1759 3843 ±50m] 1♀ 19 August 1955 [ref. 27/55], leg. Leif Reinhart Natvig; **ON**, Vestre Slidre: Olberg, Frikstadhovda [EIS 52; 32V MN 9612 7254 ±250m] 1♀ 10–17 August 1996, leg. Ove Sørlibråten; **BØ**, Modum: Kløftefoss S [EIS 35; 184m.a.s.l.; 32V NM 4708 6080 ±50m] 1♂ 28 July–1 August 2009 yellow pan-trap / sand pit / pine forest, leg. Lars Ove Hansen; **VE**, Horten: Adalstjernet SE [EIS 19; 32V NL 8170 8216 ±50m] 1♀ 12 August–24 October 2003 Malaise-trap / bog, leg. Eirik Rindal; Tjøme: Sandø N [EIS 19; 32V NL 8385 5029 ±50m] 2♀♀ 14 June–20 July 2007 pit-fall trap / sandy beach / pine forest, leg. Lars Ove Hansen.

Biology: Parasitoid of several families of Lepidoptera, mostly Noctuidae.

Distribution: Europe: Denmark, Finland, Sweden and Norway; Asia; N & S America. **Norway:** **Ø** Sarpsborg.

Meteorus ruficeps (Nees, 1834)

Material examined: **BØ**, Hurum: Mølen [NW] [EIS 19; 32V NL 8492 9548 ±10m] 1♀ 17 June–10 July 2010 Malaise-trap / sandy beach, leg. Lars Ove Hansen; Nedre-Eiker: Ryggsetra [EIS 28; 32V NM 5879 2214 ±25m] 1♀ 1–31 July 1994 Malaise-trap A / hay meadow, leg. Yngvar Berg & Lars Ove Hansen; **AAV**, Birkenes: Birkeland, Nordåsen [EIS 6; 32V MK 5549 6608 ±50m] 2♀♀ 1–30 September 2002 Malaise-

trap, leg. Svein Svendsen; **VAY**, Kristiansand: Bråvann [EIS 2; 32V MK 3725 4145 ±50m] 1♀ 5 September 1995, 1♀ 15 September 1995, leg. Kai Berggeren; **MRY**, Gjemnes: Batnafjorden, Knutset [EIS 84; 32V MQ 3655 7955 ±100m] 1♀ 6 June 2004, leg. Halvard Hatlen.

Biology: Primarily parasitizing Tortricidae (Lepidoptera), but has also been recorded from Gelechiidae, Geometridae, Noctuidae and Tineidae; not previously recorded from Norway.

Distribution: Europe: Sweden and Norway; Asia.

***Meteorus tabidus* (Wesmael, 1835)** (Figure 1)

Material examined: **AK**, Oslo: Bleikøya N [EIS 28; 32V NM 9750 4035 ±50m] 1♂ 15 July–29 August 2008 Malaise-trap/ forest edge, leg. Anders Endrestøl.



FIGURE 1. *Meteorus tabidus*, 1♂ Oslo, Bleikøya (N), 15 July–29 August 2008, leg. A. Endrestøl. Photo: Karsten Sund.

Biology: Recorded as a parasitoid of Coleoptera (Cerambycidae) and Coleophoridae, Geometridae, Psychidae and Tortricidae (Lepidoptera). Host records from Coleoptera may be unlikely.

Distribution: Europe: Sweden; Asia; not previously recorded from Norway.

***Meteorus tenellus* Marshall, 1887**

Material examined: No material present in the collections at the Natural History Museum of Oslo.

Biology: Reared from *Acleris hastiana* (Lepidoptera, Tortricidae).

Distribution: Europe: Austria; Finland; Lithuania; Sweden; United Kingdom; Yugoslavia; Asia. **Norway:** **NTI** Overhalla (Strand 1919).

***Meteorus versicolor* (Wesmael, 1835)**

Material examined: **Ø**, Hvaler: Vesterøy, Guttormsvauen [EIS 20; 32V PL 06232 51607 ±50m] 1♀ ex larva *Anarta myrtilli* (L., 1761) (Lepidoptera, Noctuidae) collected 23 May 2006 on *Calluna vulgaris* (L.) Hull, leg. Ove Søribråten; Hvaler: Vesterøy, Langekil [EIS 20; 32V PL 0797 5312 ±50m] 1♀ ex larva *Anarta myrtilli* (L., 1761) (Lepidoptera, Noctuidae) collected 9 May 2008 on *Calluna vulgaris* (L.) Hull, leg. Ove Søribråten; Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 19 May 2002, leg. Ove Søribråten; **AK**, Oslo: Ekebergskråningen SE [EIS 28; 32V NM 9891 4023 ±10m] 7♀ 19 August–22 October 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl; Nes: Auli, Kjennsmo [EIS 37; 32V PM 3509 5583 ±50m] 1♀ ex larva *Coranarta cordigera* (Thunberg, 1788) (Lepidoptera, Noctuidae) collected 23 April 2008 on *Calluna vulgaris* (L.) Hull, leg. Ove Søribråten; Ullensaker: Holtmarka, Holtsætra [EIS 37; 32V PM 2805 6239] 1♀ 19 October 1996, leg. Ove Søribråten; **BØ**, Hurum: Østnestangen [EIS 19; 32V NL 8532 9970 ±50m] 1♀ 1♂ 8 July–20 August 1995 Malaise-trap / pine forest, leg. Lars Ove Hansen.

Biology: Recorded parasitizing 14 different families of Lepidoptera.

Distribution: Europe: Finland, Sweden and Norway; Asia. **Ø** Hvaler.

***Zelee annulicrus* (Thomson, 1895)** (Figure 2)

Material examined: **AK**, Oslo: Bygdøy, Paradisbukta [SW] [EIS 28; 32V NM 9337 4142 ±25m] 1♀ 27 June–25 July 2006 Malaise-trap / meadow, leg. Anders Endrestøl & Stefan Olberg; Ullensaker: Sessvollmoen W [EIS 36; 32V PM 1780 8054 ±25m] 1♀ 26 June–25 August 2007 Malaise-trap [A] / sandy pine forest, leg. Lars Ove Hansen.

Biology: No data available.

Distribution: Europe: Sweden; not previously recorded from Norway.

***Zelee albiditarsus* Curtis, 1832**

Material examined: **Ø**, Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 11 July 1996, leg. Ove Søribråten; **AK**, Frog: Frog church, Danmark [EIS 28; 32V NM 9690 1867 ±50m] 1♀ 27 May–21 August 2004 Malaise-trap / oak grove, leg. Lars Ove Hansen & Eirik Rindal; Oslo: Hovedøya SE, «Kommandantboligen» [EIS 28; 32V NM 9696 4070 ±25m] 1♂ 27 May–29 June 2005 Malaise-trap, leg. Øivind Gammelmo & Ole Jørgen Lønnve; Bærum: Kjaglidalen [EIS 28; 32V NM 7896 4705 ±100m] 1♀ 4 July 1997, leg. Erik Heibo & Ole J. Lønnve; Asker: Konglungen [EIS 28; 32V NM 8337 3374 ±500m] 1♀ 9 July 1999, leg. Ove Søribråten; Bærum: Haslum [EIS 28; 32V NM 8762 4353 ±1000m] 1♀ 3 July 1997, leg. Ole J. Lønnve; Sørur: Lørenfallet, Dammyra [EIS 37; 32V PM 2125 5391 ±50m] 1♀ 6 June 2007, leg. Ove Søribråten; Ullensaker: Holtmarka, Holtsætra [EIS 37; 32V PM 2805 6239 ±250m] 1♀ 7 July 1997, leg. Ove Søribråten; **BØ**, Drammen: Underlia [EIS 28; 32V NM 66140 24766 ±10 m] 1♀ 10–20 August 2005 light-trap, leg. Lars Ove Hansen; **NTY**, Namsos: Almedalen NR, Duna [EIS 106; 32W PS 3453 6558 ±100m] 1–21 August 1996, leg. Alf Bakke, Torstein Kvamme & Leif Aarvik; **TRY**, Tromsø: Kvaløy, Tromvik [EIS 167; 34W DC 0290 3875 ±1000m] 1♀ 29 June 2001, leg. Ove Søribråten; Karlsøy: Stakkvik [EIS 171; 34W DC 4974 6186 ±500m] 1♂ 27 June 2001, 1♀ 9 July 2001, leg. Ove Søribråten.

Biology: Recorded from several families of Lepidoptera, mainly Noctuidae, Pyralidae and



FIGURE 2. *Zelee annulicrus*, 1♀ Ullensaker, Sessvollmoen W, 26 June–25 August 2007, leg. Lars Ove Hansen. Photo: Karsten Sund.

Tortricidae.

Distribution: Europe: Denmark, Finland, Sweden and Norway; Asia; N & S America. **Norway:** **Ø** Sarpsborg, **BØ** Røyken and **AAI** Åmli.

***Zelee caligatus* (Haliday, 1835)**

Material examined: **AAV**, Arendal: Tromøy, Hove [EIS 6, UTM 32V MK 8971 7698] 1♀ 26–28 July 1996, leg. Ove Søribråten.

Biology: Recorded from Geometridae and Nymphalidae (Lepidoptera).

Distribution: Europe: Finland, Sweden and Norway; Asia. **Norway:** **Ø** Sarpsborg.

***Zelee chlorophthalmus* (Spinola, 1808)**

Material examined: **Ø**, Hvaler: Asmaløy, Huser, Gravningen [EIS 12; 32V PL 1093 4841 ±50m] 1♀ 28 July 1995, 3♀ 1♂ 7 August 1998, leg. Ove Søribråten; Moss: Jeløy, Nes [32V NL 9264 9446 ±500m] 2♀ 28 July 1998, leg. Ove Søribråten; **AK**, Oslo: Hovedøya, Lille vestre krutthus [EIS 28; 32V NM 9655 4112 ±25m] 1♀ 19 June–27 July 2006 Malaise-trap / meadow, leg. Anders Endrestøl & Stefan Olberg; Oslo: Bygdøy, Rodeløkken [EIS 28; 32V NM 9451 4315 ±25m] 1♀ 27 June–25 July 2005 Malaise-trap / slope,

leg. Anders Endrestøl & Stefan Olberg; Sørum: Lørenfallet, Egner [EIS 37; 32V PM 2571 6100 ±500m] 1♀ 1♂ 3 June 1998, leg. Ove Sørlibråten; Asker: Brønnøya [EIS 28, 32V NM 8629 3670 ±1000m] 1♀ 1♂ 1 August 1976, leg. Torgeir Edland; **BØ**, Hole: Røysøhalvøya, Søhol, 2♀♀ 1♂ 23 July–4 September 1998 Malaise-trap / calcareous meadow, leg. Lars Ove Hansen.

Biology: Recorded from several families of Lepidoptera, including Noctuidae, Pyralidae and Tortricidae.

Distribution: Europe: Finland, Sweden, Denmark and Norway; Asia; Africa. **Norway:** Ø Sarpsborg.

Zeleeceptor (Wesmael, 1835)

Material examined: **AK**, Oslo: Ekeberg-skråningen [SE] [EIS 28; 32V NM 9891 4023 ±10m] 2♀♀ 19 August–22 October 2008 Malaise-trap / west-facing slope, leg. Anders Endrestøl; Oslo: Bygdøy, Paradisbukta [SW] [EIS 28; NM 9337 4142 ±10m] 1♀ 2♂♂ 27 June–25 July 2006 Malaise-trap / meadow, leg. Anders Endrestøl & Stefan Olberg; Lørenskog: Losbydalen [EIS 29; 32V PM 1131 4007 ±100m] 1♂ 15 July 1997, leg. Ove Sørlibråten; Ullensaker: Sessvollmoen [W] [EIS 37; 204m.a.s.l.; 32V PM 1777 8051 ±25m] 1♀ 11–26 June 2007 Malaise-trap B / sandy pine forest], Sessvollmoen [W] [EIS 36; 208m.a.s.l.; 32V PM 1780 8054 ±25m] 1♀ 26 June–25 August 2007 Malaise-trap A / sandy pine forest; Sessvollmoen, Aurtjernet W [EIS 36; 200m.a.s.l.; PM 1693 7884] 1♀ 30 June–12 August 2008 Malaise-trap / sandy area / pine forest edge, leg. Lars Ove Hansen; Bærum: Kjaglidalen [EIS 28; 32V NM 7896 4705 ±100m] 1♀ 4 July 1997, leg. Erik Heibo & Ole J. Lønnve; Asker: Konglungen, Spirabukta [EIS 28; 32V 32V NM 8385 3387 ±500m] 1♀ 8 August 1999, leg. Ove Sørlibråten; **HES**, Kongsvinger: Abborhøgda [EIS 38; 33V UG 5912 7465 ±25m] 1♀ 10 August–6 September 2003 Malaise-trap / meadow, leg. Lars Ove Hansen & Karsten Sund; **OS**, Søndre Land: Odnesberga [EIS 36; 314m.a.s.l.; NM 64189 41868 ±10m] 1♂ 25 June–1 August 2009 Malaise-trap / south-facing slope / calcareous ground / mixed forest, leg. Lars Ove Hansen, Leif Aarvik & Finn Audun Grøndahl; **ON**, Vestre Slidre: Vaset, Vaset senter

[EIS 52; 32V MN 9985 6285 ±500m] 1♀ 21–22 August 1998, leg. Ove Sørlibråten; **VE**, Tjøme: Sandø [N] [EIS 19; NL 8385 5029 ±25m] 2♂♂ 14 June–20 July 2007, 1♀ 20 July–30 August 2007, 1♂ 30 August–23 October 2007 Malaise-trap B / sandy shore, 1♂ 14 June–20 July 2007 pit-fall trap B, Sandø [N] [EIS 19; NL 83970 5030 ±25m] 1♂ 14 June–20 July 2007, leg. Lars Ove Hansen; **VAY**, Kvinesdal: Kvinesdal kloster [EIS 4; 32V 32V LK 7934 6333 ±200m] 1♂ 11 September 1998, leg. Kai Berggren; **RY**, Hå: Ognå, Nylund [EIS 3; 32V LK 1385 8943 ±250m] 1x 25 August 2000, leg. Ove Sørlibråten; **NTY**, Namsos: Almdalen NR, Duna [EIS 106; 32W PS 3453 6558 ±100m] 1♂ 29 August–2 September 1996, leg. Alf Bakke, Torstein Kvamme & Leif Aarvik; **TRY**, Karlsøy, Reinøy, Stakkvik [EIS 171; 34W DC 4974 6186 ±100m] 1♀ 27 June 2001, leg. Ove Sørlibråten; **FV**, Alta: Kåfjord, Møllernes [EIS 173; 34W EC 7875 6166 ±100m] 1♀ 21 June–4 August 1996, 10♀♀ 4 August–25 September 1996 Malaise-trap / south-facing slope, leg. Lars Ove Hansen & Helge Rinden; Alta: Gargia [EIS 165; EC 964 459] 5♀♀ 22 June–6 August 1996 Malaise-trap / slope, leg. Lars Ove Hansen & Helge Rinden; **FN**, Lebesby: Ifjordfjellet [EIS 183; 35W NU 0955 1618 ±100m] 1♀ 22–23 July 1997, Erik Heibo & Ole J. Lønnve.

Biology: Recorded from several families of Lepidoptera, including Geometridae, Noctuidae, Pyralidae and Tortricidae.

Distribution: Europe: Finland, Sweden, Denmark and Norway; N America, Asia, Africa. **Norway:** **NTI** Overhalla; **NSI** Rana (Strand 1919). Ø Tunevannet, 1♀ 3 July 2000; **BØ** Hurum; **VE** Re (Våle); **HEN** Rendalen.

Discussion

Nine species not previously recorded in Norway were found. These are *Meteorius affinis*, *M. alborossicus*, *M. consimilis*, *M. limbatus*, *M. lionotus*, *M. obfuscatus*, *M. ruficeps*, *M. tabidus* and *Zelee annulicrus*. This brings the recorded number of *Meteorius* to 23 and *Zelee* to 5, in Norway. All European species of *Zelee* have now been found in Norway. Several new county

records are also presented, including records of *M. cespitator*, which had previously been recorded from Norway but without any data. The material studied by Strand (1898, 1906, 1919) may have been deposited in Berlin or Riga (Breihagen 1994), or it may be lost. However, no effort has been made to trace it, nor has the material published by Riedel *et al.* (2002) been revised in this study. *Meteorus tenellus* is kept on the list for now but the presence of this species in Norway should be reconfirmed since the species was only recorded almost 100 years ago (Strand 1919).

The data on the rearings in this study may be of particular interest. Some of these data already support existing data, such as of *Meteorus ictericus* from *Pandemis* sp. (Tortricidae) and *M. pendulus* and *M. versicolor* from larvae of Noctuidae, and the record of *Meteorus affinis* from *Infurcitinea argentimaculella* (Lepidoptera, Tineidae), reared from fruit bodies of *Lepraria* sp. (Yu *et al.* 2012).

The rearing of *Meteorus hirsutipes* from *Inonotus obliquus* (Hymenochaetales: Hymenochaetales) attacked by *Nemapogon picarella* and *Triaxomera fulvimitrella* (Lepidoptera, Tineidae) is remarkable. Given that 78 specimens of *N. picarella* were reared, but only one of *T. fulvimitrella*, it is tempting to assume that *N. picarella* was the host in this case, but we refrain from any conclusions until there are repeated, controlled rearings. No data on the biology of this species have been available until now. *Meteorus obfuscatus* has similarly been reared from fungi, but from a range of fungi, namely *Inonotus hispidus*, *Boletus fuscus*, *Inonotus hispidus* and *Phellinus igniarius*; and *Orchesia micans* (Panzer, 1794) and *O. minor* Walker 1837 (Coleoptera, Melandryidae) have been named as host species (Yu *et al.* 2012). However, it is impossible to make any definite conclusions about the host species of these two *Meteorus* spp. and more rearing data are needed.

Little is known about the biology of *Meteorus alborossicus*, but it has previously been reared from wet stumps, which indicates a saproxylic host (Stigenberg & Ronquist 2011). Specimens reported here were reared from bolts of *Picea abies* infested with *Sirex* sp. This indicates an association with a saproxylic host, probably

Sirex sp., even though it sounds unlikely, and it is important to stress that other hosts like Coleoptera larvae, could have been hiding in the bolt.

Accurate rearing data such as knowledge of the host, host plant and emergence dates provide information on the parasitoid niche and autecology. The findings presented here of three species (*M. abscissus*, *M. rubens* and *Z. albiditarsus*) found in pit-fall traps gives indications of the autecology of these species. Depending on their host association records one can hypothesize walking as a host searching behavior. More data is needed to establish whether their hosts are commonly found on the ground and whether the findings of the parasitoids in pit-fall traps were just a fluke occurrence.

Stigenberg & Ronquist (2011) noted that several species of Meteorini are attracted to light, which indicates a nocturnal behavior. Some of the records presented here support this, and in this study the following species have been taken at light: *Meteorus lionotus*, *M. pendulus*, *M. pulchricornis*, *M. ictericus* and *Zele albiditarsus*.

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