New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway V

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The study of the family Encyrtidae at the Natural History Museum of Oslo continues. Sixteen species are reported for the first time from Norway in this revision, bringing the total number of Norwegian encyrtids up to 123. Comments on the biology and distribution for these species are given. The three species *Bothriothorax cyaneus* Nikol'skaya, 1952, *Ooencyrtus acastus* Trjapitzin, 1967 and *Trjapitzinellus arboricola* Myartseva, 1980 are reported for the first time from Europe. The aim of this study is to highlight the distribution of the family in Norway and to provide a complete list of the Norwegian species.

Key words: Hymenoptera, Chalcidoidea, Encyrtidae, new records, Norway, Europe.

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Introduction

The chalcid family Encyrtidae represents one of the most important agents in biological control of insects occurring as plant pests. They are, together with the family Aphelinidae, successfully used against many pest species, especially scale insects (Hemiptera, Coccoidea) (Noyes 1985, Nikolskaya & Yasnosh 1966). More than 400 species have been used worldwide as biological control agents of insect pests (Greathead 1986, Neueschwander *et al.* 1990, Noyes 1985, 2014). Parasitoids like encyrtids are the major component of many terrestrial ecosystems and may constitute up to 20% of all insect species (LaSalle & Gauld 1991, Godfray 1994, Memmot *et al.* 1994).

This is the sixth paper on Norwegian Encyrtidae based on the collections at the Natural History Museum of Oslo. The previous papers are Hansen *et al.* (2012), Japoshvili *et al.* (2013), Japoshvili & Hansen (2013, 2014) and Hansen & Japoshvili (2013). The aim of these contributions is to highlight the distribution of the family Encyrtidae in Norway, and finally provide a catalogue of Norwegian Chalcidoidea.

Material and Methods

This contribution focuses on ethanol preserved material of Encyrtidae, in the collections at the Natural History Museum in Oslo. The material was sorted and dried using ethanol and hexamethyldisilazane (HMDS), then card mounted, or, if necessary, slide mounted, following the guidelines of Noyes (2014). For identification,

the general key to Palaearctic encyrtids was used (i.e. Trjapitzin 1989), in addition to other related publications on lower taxa (e.g. Gibson *et al.* 1997, Guerrieri & Noyes 2009, Graham 1991). The faunistic divisions within Norway follow Økland (1981), and are given in **bold**.

The coordinates are given in decimal degrees (Grid: *Lat/Lon hddd.dddd°*; datum: *WGS84*). The taxonomy follows Noyes (2014). Data on biology and distribution is extracted from Noyes (2014), and for distribution in Europe all countries are listed, but not for other regions. All records refer to fully labeled specimens or slides deposited in the collections at the Natural History Museum of Oslo, and for some duplicates in the collection at the Entomology and Institute of Entomology, Agricultural University of Georgia.

List of species

***Adelencyrtus aulacaspidis* (Brèthes, 1914)**

Material examined: AKERSHUS [**AK**], Oslo: Bleikøya [N], [N59.88921° E10.74241° ±50m; 6m a.s.l.], 1♀ 3 June–15 July 2008, Malaise trap / forest edge, leg. Anders Endrestøl.

Biology: Primary hosts are reported from the families Coccidae and Diaspididae (Hemiptera); and a parasitoid from the family Aphelinidae (Hymenoptera) Noyes (2014).

Distribution: Europe: Bulgaria, Czech Republic, Croatia, France, Germany, Hungary, Italy, Moldova, Russia (St. Petersburg), Slovenia, Spain, Switzerland and Ukraine; Asia (east to Japan); Africa; North and South America; Australia (Fusu 2014, Noyes 2014).

***Aphycus moravicus* (Hoffer, 1952)**

Material examined: VESTFOLD [**VE**], Re [Våle]: Langøya N [N59.49981° E10.36611° ±10m], 1♀ 1 September–26 October 1991, Malaise trap / calcareous meadow / seashore, leg. Lars Ove Hansen.

Biology: No information in Noyes (2014).

Distribution: Europe: Czech Republic, Hungary, Moldova, Slovakia and Ukraine; Asia: Russia (Altai Krai and Irkutsk Oblast) (Fusu 2014, Noyes 2014); first record from Northern Europe.

***Bothriothorax cyaneus* Nikol'skaya, 1952**

Material examined: AKERSHUS [**AK**], Bærum: Oksenøya, Storøykilen NR [N59.89466° E10.60080° ±10m], 1♀ 1 July–31 August 2002, Malaise trap / calcareous meadow / seashore, leg. Lars Ove Hansen.

Biology: No information in Noyes (2014).

Distribution: Asia: Russia (Yakut ASSR) (Noyes 2014); first European record.

Coelopencyrtus arenarius (Erdös, 1957)

Material examined: BUSKERUD eastern [**BØ**], Drammen: Underlia [N59.75551° E10.17677° ±10m], 1♀ 1–31 July 1995, Malaise trap / south facing slope / pine forest, leg. Lars Ove Hansen.

Biology: Several species of solitary bees are reported as primary hosts: *Heriades* sp. and *Hylaeus* sp. (Hymenoptera: Megachilidae and Colletidae) (Noyes 2014).

Distribution: Europe: Czech Republic, England, Finland, Germany, Hungary, Moldova, Russia (Moscow Oblast and Voronezh Oblast), Slovakia, Sweden, Ukraine, United Kingdom and Serbia; Asia: Turkey (Fusu 2014, Noyes 2014).

***Coelopencyrtus callidii* (Jansson, 1957)**

Material examined: BUSKERUD eastern [**BØ**], Røyken: Kinnartangen [N59.713501° E10.336357°±10m], 1♀ 1–31 July 1993, Malaise trap / forest edge / meadow, leg. Lars Ove Hansen.

Biology: The following primary hosts are reported: *Callidium aeneum* (De Geer, 1775) (Coleoptera: Cerambycidae), *Megachile rotundata* Fabricius, 1787 and *Hylaeus communis* Nylander, 1852 (Hymenoptera: Megachilidae and Colletidae) (Noyes 2014).

Distribution: Europe: Denmark, England, Finland, Moldova, Russia (Kaluga Oblast), Sweden and Turkey; Asia (east to Mongolia) (Fusu 2014, Noyes 2014).

***Copidosoma charon* Guerrieri & Noyes, 2005**

Material examined: VESTFOLD [**VE**], Nøtterøy: Mellom Bolærne [N59.21420° E10.54854° ±250m], 1♀ 4–26 July 1995, Malaise trap / mixed forest / seashore, leg. Arne Fjellberg & Oddvar Hanssen. MØRE OG ROMSDAL interior

[**MRI**], Norddal: Tafjord, Fjøra [N62.2950° E07.3117° ±500m], 2♀♀ 23 June–18 July 1993, Malaise trap, leg. Oddvar Hanssen.

Biology: One primary host record is given: *Exoteleia dodecella* (Lepidoptera: Gelechiidae) (Guerrieri & Noyes 2005).

Distribution: Europe: Austria, Bosnia Hercegovina, Czech Republic, England, Finland, France, Spain and Sweden (Guerrieri & Noyes 2005, Noyes 2014).

***Mahencyrtus comara* (Walker, 1837)**

Material examined: BUSKERUD eastern [**BØ**], Røyken: Kinnartangen [N59.713501° E10.336357° ±10m], 1♀ 1–31 July 1993, Malaise trap / forest edge / meadow, leg. Lars Ove Hansen.

Biology: Various species of Coccidae and Pseudococcidae (Hemiptera) are reported as primary hosts (Hemiptera) (Noyes 2014).

Distribution: Europe: Croatia, Czech Republic, Denmark, England, Finland, Germany, Hungary, Ireland (north and south), Italy, Lithuania, Portugal (Madeira), Moldova, Netherlands, Poland, Romania, Russia (Adygey AO, Kaluga Oblast, Lipetsk Oblast, Moscow Oblast, Murmansk Oblast, Penza Oblast, Vladimir Oblast, Voronezh Oblast and St. Petersburg), Slovakia, Spain, Sweden and Ukraine; Asia: East to Khabarovsk Krai and Magadan Oblast in Russia (Fusu 2014, Noyes 2014).

***Metaphycus insidiosus* (Mercet, 1921)**

Material examined: HEDMARK south [**HES**], Elverum: Starmoen NR [N60.84984° E11.69196°±25m; 210m a.s.l.], 1♀ 29 July–14 September 2004, Malaise trap S / sandy pine forest, leg. Lars Ove Hansen & Eirik Rindal.

Biology: Parasitoids on Coccidae (Hemiptera), in particular the genera *Eulecanium*, *Parthenolecanium* and *Pulvinariaon,* associated with a variety of plant species belonging to at least 13 different plant families (Noyes 2014).

Distribution: Europe: Andorra, Austria, Bulgaria, Czech Republic, Denmark, England, Finland, France, Germany, Greece, Hungary, Italy, Moldova, Poland, Romania, Russia (St. Petersburg), Slovakia, Spain, Sweden and Switzerland; Asia: Armenia; North America (Fusu 2014, Noyes 2014).

***Metaphycus petitus* (Walker, 1851)**

Material examined: BUSKERUD eastern [**BØ**], Nedre-Eiker: Mjøndalen, Ryggkollen [W], [N59.75445° E10.05056°±10m; 16m a.s.l.], 1♀ 12 July–3 August 2008, Malaise trap / sand pit / pine forest, leg. Lars Ove Hansen.

Biology: *Eriococcus insignis* Newstead, 1891 (Hemiptera: Eriococcidae) on *Calluna* sp. (Ericaceae), is the only primary host listed by Noyes (2014).

Distribution: Europe: Bulgaria, Czech Republic, Denmark, England, Finland, Greece, Ireland (N & S), Italy, Moldova, Slovakia and Spain; Asia (Fusu 2014, Noyes 2014).

Ooencyrtus acastus Trjapitzin, 1967

Material examined: BUSKERUD eastern [**BØ**], Drammen: Underlia, [N59.75551° E10.17677° ±10m], 1♀ 1–31 July 1994, Malaise trap / south facing slope / pine forest, leg. Lars Ove Hansen.

Biology: No information in Noyes (2014).

Distribution: Asia: Russia (Primorsky Krai) (Noyes 2014); first European record.

Ooencyrtus telenomicida (Vassiliev, 1904)

Material examined: BUSKERUD eastern [**BØ**], Drammen: Underlia, [N59.75551° E10.17677° ±10m], 1♀ 1–31 August 1994, Malaise trap / south facing slope / pine forest, leg. Lars Ove Hansen.

Biology: Reported from a long series of primary hosts from the following families: Coreidae, Pentatomidae, Pyrrhocoridae, Reduviidae and Scutelleridae (Hemiptera); Scelionidae (Hymenoptera) and Lasiocampidae, Lymantriidae, Notodontidae, Papilionidae and Sphingidae (Lepidoptera) (Noyes 2014).

Distribution: Europe: Bulgaria, Croatia, Czech Republic, Germany, Hungary, Italy, Montenegro, Portugal, Romania, Russia (Adygey AO, Rostov Oblast, Saratov Oblast and Voronezh Oblast), Serbia, Slovakia, Spain, Sweden and Ukraine; Asia (east to China); Africa (Fusu 2014, Noyes 2014).

Pseudencyrtus eumedes Trjapitzin, 1978

Material examined: BUSKERUD western **[BV]**, Sigdal: Heimseteråsen, [N60.0369° E09.4258°±100m; 425m a.s.l.], 1♀ 25 June 1999, canopy fogging / *Pinus silvestris* [Furukrone nr. 1 / sektor 1 / 0m], leg. Karl Thunes & Jon Skartveit.

Biology: No information in Noyes (2014).

Distribution: Europe: Austria, Finland, Lithuania, Montenegro, Russia (Kalinin Oblast, Kaluga Oblast, Karelian ASSR, Moscow Oblast, Murmansk Oblast, Nizhniy Novgorod Oblast, Pskov Oblast, St. Petersburg and Sverdlovsk Oblast), Spain and Sweden (Fusu 2014, Noyes 2014).

Psyllaephagus vendicus **(Erdös, 1961)**

Material examined: BUSKERUD eastern **[BØ],** Kongsberg: Skollenborg, Labro [E], [N59.61841° E9.67744° ±10m; 120 m a.s.l.], 1♀ 9 July–2 August 2008, Malaise trap / pine forest / sand pit, leg. Lars Ove Hansen.

Biology: No information.

Distribution: Czech Republic, Finland, Hungary, Latvia, The Netherlands, Russia; Asia: Mongolia and (Trjapitzin 1989).

Comments: *Psyllaephagus vendicus* was synonymized with *Ps. cocci* Alam, 1957 by Graham (1969), and then, subsequently, *Ps. cocci* was synonymized with *Ps. lusitanicus* (Mercet, 1921) by Noyes (1981). *Ps. vendicus* is thus considered as a synonym of *Ps. lusitanicus* by Fusu (2014) and Noyes (2014). However, these synonymizations were not accepted by Trjapitzin (1989). *Ps. lusitanicus* is bigger by size (1.3 mm) and tegulae are completely dark, while *Ps. vendicus* is smaller (0.9–1.1 mm) and tegulae basal 2/3 are white. We approve Trjapitzin (1989) and consider *Ps. vendicus* as a valid species.

Syrphophagus herbidus **(Dalman, 1820)**

Material examined: BUSKERUD eastern [**BØ**], Røyken: Kinnartangen [N59.713501° E10.336357° ±10m], 1♀ 1–31 July 1993, Malaise trap / forest edge / meadow, leg. Lars Ove Hansen.

Biology: Only one primary host reported: *Aulacaspis rosae* (Bouché 1833) (Hemiptera: Diaspididae) (Noyes 2014).

Distribution: Europe: Bulgaria, Croatia, Czech Republic, Denmark, England, Finland, France, Germany, Hungary, Ireland [N], Moldova, Russia (Kaluga Oblast), Slovakia and Sweden; Asia (east to Turkmenistan) (Fusu 2014, Noyes 2014).

Syrphophagus taeniatus (Förster, 1861)

Material examined: BUSKERUD eastern [**BØ**], Drammen: Underlia, [N59.75551° E10.17677° ±10m], 1♀ 1–31 July 1994, Malaise trap / south facing slope / pine forest, leg. Lars Ove Hansen.

Biology: The following primary hosts are reported; *Cacopsylla peregrina* (Förster, 1848) and *C. pyri* (L., 1758) (Hemiptera: Psyllidae), associated with *Pyrus* sp. including *P. communis* (Rosaceae) (Noyes 2014).

Distribution: Europe: Czech Republic, England, Germany, Greece, Moldova, Portugal, Russia, Sweden, Switzerland and Ukraine; Asia (east to Mongolia) (Fusu 2014, Noyes 2014).

Trjapitzinellus arboricola **Myartseva, 1980**

Material examined: BUSKERUD eastern [**BØ**], Drammen: Underlia, [N59.75551° E10.17677° ±10m], 1♀ 1–30 June 1992, Malaise trap / south facing slope / pine forest, leg. Lars Ove Hansen.

Biology: No information in Noyes (2014).

Distribution: Asia: Turkmenistan (Noyes 2014); first European record.

New records

Copidosoma cuproviride **Springate & Noyes, 1990**

Material examined: TELEMARK coastal [**TEY**], Bamble: Langøya N [N59.01080° E9.75496°±25m; 3 m a.s.l.], 1♀ 31 July–15 November 1995, Malaise trap / sandy area / seashore, leg. Lars Ove Hansen.

Distribution: Europe: England, France, Germany, Netherlands and Sweden; North America (Noyes 2014); previously reported from Norway, Drammen (BØ) (Japoshvili & Hansen 2014).

***Syrphophagus pertiades* (Walker, 1837)**

Material examined: AKERSHUS [**AK**], Oslo: Bygdøy, Bygdøy sjøbad, [N59.91192° E10.66303° ±25m; 10m a.s.l.], 1♀ 8 August–27 September 2007, Malaise trap / forest edge, leg. Anders Endrestøl.

Biology: Primary hosts are reported from the families Coccidae and Diaspididae (Hemiptera); and a parasitoid from the family Aphelinidae (Hymenoptera) Noyes (2014).

Distribution: Europe: Bulgaria, Czech Republic, Croatia, France, Germany, Hungary, Italy, Moldova, Russia (St. Petersburg), Slovenia, Spain, Switzerland and Ukraine; Asia (east to Japan); Africa; North and South America; Australia (Fusu 2014, Noyes 2014). Previously reported from Norway, but only as «Norwegian» without any further details (Trapitzin 1989).

Discussion

Sixteen species of Encyrtidae not hitherto reported from Norway were recorded in this investigation. The three species *Bothriothorax cyaneus*, *Ooencyrtus acastus* and *Trjapitzinellus arboricola* are reported for the first time from Europe. This increases the number of Norwegian encyrtid species to 123. Ottesen (1993) estimated the number of encyrtid species in Norway to 120, but this shows that the estimated number has just been passed by the real number.

The five species *Coelopencyrtus arenarius, Ooencyrtus acastus, Ooencyrtus telenomicida, Syrphophagus taeniatus* and *Trjapitzinellus arboricola* are all exclusively reported from the locality Underlia in Drammen municipality. A malaise trap was run at this locality for 10 years, and this may indicate that sampling during longer periods may catch up rarer species which are not taken in shorter sampling periods.

As most of the studied material was collected using Malaise traps, we have no information about host associations on these species. However, this reveals valuable information, and may be used to give predictions about the fauna and probable hosts of the Norwegian encyrtid species.

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