

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

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The study of the family Encyrtidae at the Natural History Museum of Oslo continues. 13 species are reported for the first time from Norway in this revision, bringing the total number of Norwegian encyrtids up to 136. Comments on the biology and distribution for these species are given. The two species *Anagyrus galinae* (Myartseva, 1982) and *Blastothrix hissarica* Sugonjaev, 1972 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, canopy fogging, yellow pan-traps, Malaise traps, Coccoidea, scale insects.

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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, 2015). 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 seventh 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, 2015). 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 (2015). For identification, the general key for Palearctic 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 follows 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 (2015). Data on biology and distribution is extracted from Noyes (2015), 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 Biocontrol Research Centre, Agricultural University of Georgia.

List of species

Anagyrus galinae (Myartseva, 1982)

Material examined: BUSKERUD eastern [BØ], Nedre-Eiker: Mjøndalen, Ryggkollen [W], [N59.75445° E10.05056° ±10m; 16m.a.s.l.], 2♀♀ 12 July–3 August 2008, Malaise trap/sand-pit/pine forest, leg. Lars Ove Hansen.

Biology: The mealybug *Trionymus copiosus* Borchsenius, 1949 (Hemiptera: Pseudococcidae) is reported as primary host (Noyes 2015).

Distribution: Asia: Georgia, Peoples' Republic of China (Hainan) and Turkmenistan (Noyes 2015); first European record.

Ageniaspis atricollis (Dalman, 1820)

Material examined: BUSKERUD eastern [BØ], Hurum: Mølen [N59.489153° E10.498874° ±10m; 5m.a.s.l.] 1♀ 10 July–15 August 2010, Malaise trap 02/sandy shore, leg. Lars Ove Hansen.

Biology: The families Gracillaridae, Tortricidae and Yponomeutidae (Lepidoptera) are reported as primary hosts (Noyes 2015).

Distribution: Belgium, «Czechoslovakia», Denmark, England, Finland, France, Germany, Hungary, Ireland, Italy, Moldova, Netherlands,

Poland, Russia (Kaliningrad Obl., Kaluga Obl., Leningrad obl. and Vladimir Obl.), Sweden, Ukraine; Asia: Georgia and Russia (Fusu 2015, Noyes 2015).

Blastothrix hissarica Sugonjaev, 1972

Material examined: VESTFOLD [VE], SANDE: Kommersøya [S], Skarpsno [N59.515185° E10.323728° ± 25m; 5m.a.s.l.] 1♀ [slide mounted] 2 August–26. October 1991; Malaise trap/calcareous slope, leg. Lars Ove Hansen.

Biology: The soft scale genus *Eulecanum* sp. (Hemiptera: Coccidae) is reported as primary host (Noyes 2015).

Distribution: Asia: Tadjikistan (Noyes 2015); first European record.

Copidosoma floridanum (Ashmead, 1900)

Material examined: AKERSHUS [AK], Oslo: Østensjøvannet, Manglerud, [N59.89217° E10.82662° ±10m; 128m.a.s.l.] 1♂ 9 July–1 August 1995, Malaise trap / meadow, leg. Morten Falck; Ullensaker: Sessvollmoen, Aurtjernet W [N60.23147° E11.11660° ±10m, 200m.a.s.l.] 1♂ 26 June–25 August 2007, Malaise trap/sandy area/forest edge, leg. Lars Ove Hansen; BUSKERUD eastern [BØ], Drammen: Underlia [N59.75551° E10.17677° ±10m; 117m.a.s.l.] 1♀ 1–30 June 1992, 1♀ 1–31 August 1994, Malaise trap/south facing slope/pine forest, leg. Lars Ove Hansen; BUSKERUD western [BV], Rollag: Vårviken [N60.0158° E09.2594° ±50m; 215m.a.s.l.] 1♀ 1–31 August 1994, Malaise trap/sandy area, leg. Lars Ove Hansen & Bjørn A. Sagvolden; TELEMARCOASTAL [TEY] Drangedal, Henseid [N59.0595° E9.2145° ±50m; 85m.a.s.l.] 1♀ 11 July 2012, oak canopy fogging/tree #23, leg. Karl H. Thunes; FINNMARK Western [FV], Alta: Detsika, Buolamalia [N69.8628° E23.3297° ±10m; 70m.a.s.l.] 1♀ 3 July–8 August 1995, Malaise-trap/sandy slope, leg. Lars Ove Hansen & Helge Rinden [Ref.: 282/197].

Biology: Several families of Lepidoptera are reported as primary hosts, in particular Noctuidae and the subfamily Plusiinae (Guerrieri & Noyes 2005, Noyes 2015).

Distribution: Europe: Belarus, Bulgaria,

Czech Republic, England, France, Germany, Greece, Hungary, Italy, Netherlands, Portugal, Russia («St.Petersburg», Moscow Obl., Bryansk Obl., Ivanovo Obl., Kaluga Obl., Nizhniy Novgorod Obl. and Voronezh Obl.), Serbia, Slovakia, Spain, Sweden and «Yugoslavia»; Asia: Azerbaijan, Bangladesh, Georgia, India, Indonesia, Iran, Japan, Malaysia, North Korea, Peoples' Republic of China, Sri Lanka, Thailand and Turkey; Africa: Cape Verde, Ivory Coast and Senegal; Australia: Australia, New Zealand: North and South America: from Canada to Argentina (Guerrieri & Noyes 2005, Fusu 2015, Noyes 2015).

Copidosoma boreale Hoffer, 1970

Material examined: BUSKERUD eastern [BØ], Kongsberg: Skollenborg, Labro [E] [N59.61841° E9.67744° ±10m; 120m.a.s.l.], 1♀ 30 May–9 July 2008, Malaise trap/pine forest/sand-pit, leg. Lars Ove Hansen.

Biology: Unknown (Guerrieri & Noyes 2005, Noyes 2015).

Distribution: Europe: Czech Republic and England (Guerrieri & Noyes 2005, Fusu 2015, Noyes 2015).

Ericydnus pilosulus Graham, 1991

Material examined: BUSKERUD eastern [BØ], Nedre-Eiker: Mjøndalen, Ryggkollen [W], [N59.75390° E10.04912° ±50m; 17m a.s.l.] 1♀3♂♂ 1–31 July 2008, yellow pan-trap/sand pit/pine forest, leg. Lars Ove Hansen.

Biology: Unknown (Noyes 2015).

Distribution: Europe: Canary Islands, France, Romania and Spain (Fusu 2015, Noyes 2015).

Moraviella inexpectata Hoffer, 1954

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

Biology: *Puto pilosellae* (Sulc, 1898) (Hemiptera: Pseudococcidae) is reported as primary host (Noyes 2015).

Distribution: Europe: Czech Republic, Denmark, Romania and Russia («St.Petersburg»);

Asia: Russia (Irkutsk Obl.) (Fusu 2015, Noyes 2015).

Parablatticida brevicornis (Dalman, 1820)

Material examined: HEDMARK south [HES], Elverum: Starmoen [E] [N60.85283° E11.69589° ±100m; 205m.a.s.l.] 1♀ 19–22 August 2013, yellow pan-trap [Ref.320-001]/E of the road/sandy pine forest, leg. Lars Ove Hansen & Norah Manyasi.

Biology: *Yponomeuta evonymellus* (Linnaeus, 1758) (Lepidoptera: Yponomeutidae) is reported as primary host (Noyes 2015).

Distribution: Europe: «Czechoslovakia», England, Finland, Germany, Hungary, Ireland, Italy, Montenegro, Romania, Russia («St. Petersburg» and Karelian ASSR) Spain and Sweden; Asia: Azerbaijan, Georgia, India, Mongolia, Peoples' Republic of China and Russia (Sakhalin Obl.) (Fusu 2015, Noyes 2015).

Subprionomitus festucae (Mayr, 1876)

Material examined: SOGN OG FJORDANE interior [SFI], Luster: Jostedal, Øyastrondi [N61.72325° E7.36985° ±10m; 563m.a.s.l.] 1♀ 12 July–12 September 2006, Malaise trap, leg. Geir Söli, Øivind Gammelmo & Eirik Rindal.

Biology: The following primary hosts are reported: *Eriopeltis festucae* (Boyer de Fonscolombe, 1834) and *Scythia stipae* Hadzibejli, 1967 (Hemiptera: Coccidae) and *Leucopomyia* [=Leucopis] *silesiaca* (Egger, 1862) (Diptera: Chamaemyiidae) (Noyes 2015).

Distribution: Europe: Austria, Bulgaria, Croatia, Czech Republic, England, France, Germany, Hungary, Italy, Moldova, Russia («St. Petersburg» and Kaluga Obl.) Slovakia, Spain, Ukraine and «Yugoslavia»; Asia: Armenia, Azerbaijan, Georgia, Kazakhstan, Russia (Karachai-Cherkess AR and Volgograd Obl.) and Turkmenistan (Fusu 2015, Noyes 2015).

Syrphophagus ariantes (Walker, 1837)

Material examined: AKERSHUS [AK], Oslo: Nordmarka, Svatorsetra [N60.02543° E10.64781° ±5m; 325m.a.s.l.] 1♀ 19 July–16 October 2010, Malaise trap/meadow/mixed forest, leg. Lars Ove Hansen & Mari Steinert.

Biology: *Trioza urticae* (Linnaeus, 1758) (Hemiptera: Triozidae) is the only reported primary host (Noyes 2015).

Distribution: Europe: Bulgaria, Czech Republic, England, France, Hungary, Lithuania, Moldova, Russia («St. Petersburg», Moscow Obl. and Kaluga Obl.), Slovakia, Sweden and Ukraine; Asia: Georgia, Mongolia and Russia (Irkutsk Obl., Magadan Obl. and Primor'ye Kray) (Fusu 2015, Noyes 2015).

Syrphophagus mamitus (Walker, 1837)

Material examined: AKERSHUS [AK], Asker: Nesøya, Storenga [N59.871196° E10.542489° ±10m; 2m.a.s.l.] 1♀ ex *Lipara*-gall (Diptera: Chloropidae) on *Phragmites australis*, picked April 2003, hatched June 2003, leg. Lars Ove Hansen.

Biology: The following primary hosts have been reported: *Aphis craccae* Linnaeus, 1758, *A. fabae* Scopoli, 1763, *A. pomi* De Geer, 1773, *Chromaphis juglandicola* (Kaltenbach, 1843), *Drepanosiphum platanoidis* (Schrank, 1801), *Nasonovia nigra* (Hille Ris Lambers, 1931), *Symydobius oblongus* (von Heyden, 1837) (Hemiptera: Aphididae), and *Cacopsylla crataegi* (Schrank, 1801), *C. peregrina* (Foerster, 1848), *C. pruni* (Scopoli, 1763), *C. pyri* (Linnaeus, 1761), *C. pyrisuga* (Foerster, 1848), *C. mali* (Schmidberger, 1836) (Hemiptera: Psyllidae) (Noyes 2015).

Distribution: Europe: Czech Republic, Denmark, England, France, Germany, Latvia, Moldova, Montenegro, Netherlands, Serbia, Slovakia, Spain, Sweden and «Yugoslavia»; Asia: Georgia and Russia (Primor'ye Kray) (Fusu 2015, Noyes 2015).

Trechnites fuscitarsis (Thomson, 1876)

Material examined: AKERSHUS [AK], Asker: Nesøya, Storenga [E] [N59.8700° E10.5408° ±10m; 13m.a.s.l.] 1♀ 1 September–30 November 2003, Malaise trap, leg. Lars Ove Hansen; Ullensaker: Sessvollmoen, Aurtjernet W [N60.23147° E11.11660° ±10m, 200m.a.s.l.] 1♀ 26 June–25 August 2007, Malaise trap/sandy area/forest edge, leg. Lars Ove Hansen; BUSKERUD eastern [BØ], Drammen: Underlia [N59.75551° E10.17677° ±10m; 117m.a.s.l.] 1♀ 1–30 June

1999, Malaise trap/south facing slope/pine-forest, leg. Lars Ove Hansen.

Biology: No information in Noyes (2015).

Distribution: Europe: Czech Republic, Denmark, England Germany, Hungary, Moldova, Russia («St.Petersburg» and Moscow Obl.), Slovakia and Sweden; Asia: Mongolia, Russia (Tyumen' Obl., Chita Obl., Altai Kray and Primor'ye Kray) and Turkmenistan (Fusu 2015, Noyes 2015).

Trichomasthus frontalis Alam, 1957

Material examined: AKERSHUS [AK], Enebakk: Østmarka NR, Tonekolldalen [E], [N59.832168°, E11.022149° ±50m, 315m.a.s.l.], 5♀♀ 20 August 2005, canopy fogging spruce (*Picea abies*)/tree #3, leg. Stein Andersen.

Biology: The following primary hosts have been reported: *Eriopeltis festucae* (Boyer de Fonscolombe, 1834), *E. ?frontalis* and *E. sachalinensis* Borchsenius, 1956 (Hemiptera: Coccidae), and *Eriococcus sachalinensis* Siraiwa, 1939 (Hemiptera: Eriococcidae) (Noyes 2015).

Distribution: Europe: England, Germany, Russia (Moscow Obl.) and Sweden; Asia: India and Russia (Sakhalin Obl.) (Fusu 2015, Noyes 2015).

Discussion

Thirteen species of Encyrtidae not hitherto reported from Norway were recorded in this investigation. The two species *Anagyrus galinae* (Myartseva, 1982) and *Blastothrix hissarica* Sugonjaev, 1972 are reported for the first time from Europe. This increases the number of Norwegian encyrtid species to 136. Ottesen (1993) estimated the number in Norway to 120, but this study shows that the true number is much higher, and all recent contributions have given considerable additions.

Most of the studied material was collected using Malaise traps, which seem to be an efficient way of collecting, but gives reduced information about host associations on these species. However, the method reveals some valuable information, and may be used to give predictions about the habitat and probable hosts of the encyrtid species. Two

species were collected in yellow pan-traps at sand pits (i.e. *Ericydnus pilosulus* and *Parablatticida brevicornis*), which seems to be a less efficient method for encyrtid collecting, but may indicate that some of these species are flower visitors.

Furthermore, two species are collected in canopy fogging, namely *Copidosoma floridanum* on oak (*Quercus* sp.), and *Trichomasthus frontalis* on spruce (*Picea abies*). This should indicate that the species may be associated with the representative tree species, but both have quite general host choices (Noyes 2015). However, *T. frontalis* has, according to Noyes (2015), the scale insects *Eriopeltis festucae*, *E. sachalinensis* and *Eriococcus sachalinensis* as primary hosts, all associated with grasses (Poaceae) (Ben Dov 2015), which of course grow on the ground. They may then have some resting or sexual behavior up in the trees instead, or some additional hosts, but this is quite unlikely, because these scale insects are entirely associated with grasses (Poaceae) (Ben Dov 2015).

Finally, *Syrphophagus mamitus* was hatched from *Phragmites australis*, when investigating insects associated with *Lipara*-galls (Diptera, Chloropidae). However, it is unlikely it is associated with these, because the families Aphidae and Psyllidae (Hemiptera) are given as primary hosts (Noyes 2015). A good guess for a possible host may be the aphid *Hyalopterus pruni* (Geoffroy, 1762), which is sometimes extremely abundant on *P. australis* in Southern Norway.

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References

- Ben Dov, Y. 2015. ScaleNet. <http://www.sel.barc.usda.gov/scalenet/scalenet.htm> [Last accessed: 2 September 2015].
- Fusu, L. 2015. Fauna Europaea: Encyrtidae. In: Mitroiu, M.-D. Fauna Europaea: Chalcidoidea. Fauna Europaea, version 2.6. <http://www.faunaeur.org> [Last accessed: 2 September 2015].
- Gibson, G.A.P., Huber, J.T. & Woolley, J.B. 1997. Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). Ottawa: NRC Research Press. 794 pp.
- Godfray, H.C.J. 1994. Parasitoids: Behavioural & Evolutionary Ecology. Princeton University Press. Princeton. 488 pp.
- Graham, M.W.R. De V. 1991. Revision of western European species of *Ericydnus* Haliday (Hym., Encyrtidae), including one species new to sciences. *Entomologist's monthly magazine* 127, 177–190.
- Greathead, D.J. 1986. Parasitoids in classical biological control. Pp. 287–318 In: Waage, J.K. & Greathead, D.J. (Eds). *Insect Parasitoids*. Academic Press, London. 389 pp.
- Guerrieri, E. & Noyes, J.S. 2005. Revision of the European species of *Copidosoma* Ratzeburg (Hymenoptera: Encyrtidae), parasitoids of caterpillars (Lepidoptera). *Systematic Entomology* 30, 97–174.
- Guerrieri, E. & Noyes, J.S. 2009. A review of the European species of the genus *Trechnites* Thomson (Hymenoptera: Chalcidoidea: Encyrtidae), parasitoids of plant lice (Hemiptera: Psylloidea) with description of a new species. *Systematic Entomology* 34, 252–259.
- Hansen, L.O., Thuroczy, C.K. & Japoshvili, G. 2012. New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway, with additional information on host associations. *Norwegian Journal of Entomology* 59, 72–77.
- Hansen, L.O. & Japoshvili, G. 2013. New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway III. *Norwegian Journal of Entomology* 60, 196–200.
- Hansen, L.O. & Japoshvili, G. 2015. New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway V. *Norwegian Journal of Entomology* 62, 104–109.
- Japoshvili, G. & Hansen, L.O. 2013. New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway II. *Norwegian Journal of Entomology* 60, 68–72.

- Japoshvili, G. & Hansen, L.O. 2014. New records of Encyrtidae (Hymenoptera, Chalcidoidea) from Norway IV. *Norwegian Journal of Entomology* 61, 180–185.
- Japoshvili, G., Hansen, L.O. & Guerrieri, E. 2013. The Norwegian species of *Copidosoma* Ratzeburg (Hymenoptera: Chalcidoidea: Encyrtidae). *Zootaxa* 3619 (2), 145–153
- LaSalle, J. & Gauld, I.D. 1991. Parasitic Hymenoptera and the biodiversity crisis. *Redia* 74, 315–334.
- Memmott, J., Godfray, H.C.J. & Gauld, I.D. 1994. The structure of a tropical host-parasitoid community. *Journal of Animal Ecology* 63, 521–540.
- Neuenschwander, P., Hammond, W.N.O., Ajuonu, O., Gado, A., Echendu, N., Bokonon-Ganta, A.H., Allomasso, R. & Okon, I. 1990. Biological control of the cassava mealybug, *Phenacoccus manihoti* (Hom., Pseudococcidae) by *Epidinocarsis lopezi* (Hym., Encyrtidae) in West Africa, as influenced by climate and soil. *Agriculture, Ecosystems and Environment* 32 (1–2), 39–55.
- Nikolskaya, M.N. & Yasnosh, V.A. 1966. Aphelinidae of the European part of USSR and Caucasus (Chalcidoidea, Aphelinidae). Asc of USSR, Nauka, 295 pp.
- Noyes, J.S. 1985. Chalcidoids and biological control. *Chalcid Forum* 5, 5–10.
- Noyes, J.S. 2015. Universal Chalcidoidea Database. World Wide Web electronic publication. <http://www.nhm.ac.uk/chalcidoids> [Last accessed: 2 September 2015].
- Økland, K.A. 1981. Inndeling av Norge til bruk ved biogeografiske oppgaver – et revidert Strandsystem. *Fauna (Oslo)* 34, 167–178.
- Ottesen, P.S. 1993. Norske insektfamilier og deres artsantall. *NINA Utredning* 55, 1–40.
- Trjapitzin, V.A. 1989. Parasitic Hymenoptera of the Fam. Encyrtidae of Palaearctics. Opredeliteli po Faune SSSR. Zoologicheskim Institutom Akademii Nauk SSR, Leningrad. 488 pp.

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