

**Ceraphronidae and Megaspilidae (Hymenoptera: Ceraphronoidea)
of Poland: current state of knowledge with corrections
to the Polish checklist**

MACIEJ KRZYŻYŃSKI¹, WERNER ULRICH²

Nicolaus Copernicus University, Chair of Ecology and Biogeography, Lwowska 1,
87-100 Toruń, Poland, e-mail: ¹m_krzy@doktorant.umk.pl, ²ulrichw@umk.pl

ABSTRACT. An updated checklist of 16 Ceraphronoidea (Hymenoptera, Parasitica) species from Poland is given together with information on deposition, sampling, and, if possible, host associations. We also present a complete reference list regarding work on Polish Ceraphronoidea.

KEY WORDS: Ceraphronoidea, Ceraphronidae, Megaspilidae, check list.

INTRODUCTION

The superfamily Ceraphronoidea, containing the families Ceraphronidae and Megaspilidae, is surely the least known higher taxon among the Hymenoptera as documented in the recent catalogue by JOHNSON (2015). First established by HALIDAY (1833) as a family, revised by KIEFFER (1914), and given superfamily status by MASNER & DESSART (1967), the taxonomy of the superfamily is still in its infancy. Newer keys to the European genera and species by HELLÉN (1966), DESSART (1987) and ALEKSEEV (1978) clarified the species status of a number of species and added species to the European fauna. KIEFFER (1914) listed 106 European species of Ceraphronidae and 188 species of Megaspilidae. DESSART (1987) reviewed and described an additional 97 Ceraphronidae and 78 Megaspilidae, while ALEKSEEV (1978) mentioned 58 Ceraphronidae and 56 Megaspilidae for the Palaearctic.

The most recent compilation of Fauna Europaea (POLASZEK 2015) lists 224 described species (102 Ceraphronidae and 140 Megaspilidae) for Europe, even though in many cases their species status remains unconfirmed. However, the number of recorded species has

surely been seriously underestimated. Based on European species-area relationships and his own collections, ULRICH (1999) estimated the number to be at least 400 species.

The most recent checklist by GARBARCZYK (1997) lists 12 species of Ceraphronoidea from Poland, while BANASZAK et al. (2000) estimated that there were about 70 species of Ceraphronidae and about 45 species of Megaspilidae. In the light of the local data of ULRICH (2001, 2005), who found 46 species of Ceraphronoidea in a German beech forest and as many as 37 species on an adjacent small meadow on limestone, these figures for the Polish fauna appear to be gross underestimations. The latest faunistic data from the Czech Republic (ZEMAN & VANĚK 1999) list six species of Ceraphronoidea not recorded in Poland: *Ceraphron pedes* FÖRSTER, 1861, *C. squamiger* KIEFFER, 1907, *Dendrocerus liebscheri* DESSART, 1972, *D. solarii* (KIEFFER, 1907), *Conostigmus obscurus* (THOMSON, 1859) [as *C. arcticus* (THOMSON, 1859)] and *Lagynodes thoracicus* KIEFFER, 1906 (as *L. thoracicus*). Since sampling took place close to the Polish border, we can assume with confidence that these species are also part of the Polish fauna. HELLÉN (1966) mentioned 38 species of Ceraphronidae and 35 species of Megaspilidae. Although his list might contain a number of synonyms, and identifications are not always reliable, many of the Finnish species should also occur in Poland. Applying ULRICH's (1999, 2001) species-area relationships, we conservatively assume the true species number in Poland to be well above 200.

Our knowledge about the Ceraphronoid species range sizes, their hosts, and their ecology is similarly poor (cf. MIKÓ & DEANS 2009). Hosts are known for only a very small number of species, particularly from the genus *Dendrocerus* RATZBURG, 1852. Most *Dendrocerus* species are aphid hyperparasitoids but have also been reared from Neuroptera, and aphid predators. For instance, *D. pupparum* (BOHEMAN, 1832) is a parasitoid of the aphidophagous hoverflies *Syrphus ribesii* (LINNAEUS, 1758) and *Episyrphus balteatus* (DE GEER, 1776) (Diptera: Syrphidae) (FERGUSON 1980). *Lagynodes pallidus* (BOHEMAN, 1829) is a secondary parasitoid of Braconidae in lepidopteran larvae (KARCZEWSKI 1962, DESSART 1987). Some *Aphanogmus* (THOMSON, 1858) species attack predatory (PSCHORN-WALCHER 1956, OATMAN 1985) and gall-inducing (PARNELL 1963) cecidomyiid larvae, cybocephalid Coleoptera (EVANS et al. 2005), coniopterygid Neuroptera (PRIESNER 1960), and Thysanoptera (DESSART & BOURNIER 1971). An American species of *Conostigmus* (DAHLBOM, 1858) was reared from Mecoptera (COOPER & DESSART 1975), while LUHMAN et al. (1999) reported this species being reared from Trichoptera (reviewed in MIKÓ & DEANS 2009, BROAD & LIVERMORE 2014). Based on emergence trap samples ULRICH (2005) speculated that many species might develop in nematoceran larvae (Diptera) associated with soil microhabitats. Ceraphronid species of the Polish fauna have been reared from gall-inducing Cecidomyiidae (GARBARCZYK 1997) and found to be associated with plant fruits, although most rearing and host identifications needs confirmation.

Astonishingly, the few available quantitative assessments of Ceraphronidae and Megaspilidae (except for the genus *Dendrocerus*) abundances revealed high local densities of several tens to even hundreds of individuals per square metre emerging from forest floors (ULRICH 2001) and open landscapes (SCHMITT 2004, ULRICH 2005). These densities are comparable to those of related and better studied hymenopteran taxa like Braconidae, Ichneumonidae or Diapriidae (ULRICH 2001, 2005). These observed densities also indicate high host densities, a fact that greatly reduces the range of possible hosts to abundant Diptera, Hemiptera and possibly Coleoptera.

The present study is a first step towards a better knowledge of Polish Ceraphronoidea. We present faunistic and, if available, ecological information on 16 ceraphronoid species (12 Ceraphronidae and 4 Megaspilidae) so far recorded from Poland.

MATERIALS AND METHODS

From a literature review and examination of material deposited in the Museum and Institute of Zoology of the Polish Academy of Sciences in Warsaw (MIZ) we have updated and amended the checklist of Polish Ceraphronoidea (GARBARCZYK 1997) that contains nine species of Ceraphronidae and three species of Megaspilidae without giving details regarding identification, deposition and references. With regard to nomenclature and synonyms, we follow the Hymenoptera Name Server (<http://osuc.biosci.ohio-state.edu/>).

We examined one specimen of *Lagynodes pallidus* from the KARCZEWSKI collection in MIZ owing to its doubtful original identification. We used the key of ALEKSEEV (1978) and a Leica M2015C microscope with camera. Below, species not given in GARBARCZYK (1997) are labelled with an asterisk (*).

RESULTS

CERAPHRONIDAE

Ceraphron bispinosus (NEES VON ESENBECK, 1834)

Skierniewice, Łódź Province [as *C. striatus* FÖRSTER, 1861]: one specimen found in an apple orchard (OLSZAK 1992).

Ceraphron cursor KIEFFER, 1907

Skierniewice, Łódź Province: three specimens found on *Sambucus nigra* LINNAEUS, 1753 bordering an apple orchard (OLSZAK 1992).

***Ceraphron sulcatus* JURINE, 1807**

Skierniewice, Łódź Province: one specimen found on *Sambucus nigra* bordering an apple orchard (OLSZAK 1992).

***Aphanogmus abdominalis* (THOMSON, 1859) ***

Wolica, Mazowsze Province: 12 specimens parasitizing *Dasineura brassicae* WINNERTZ, 1853 larvae (Diptera: Cecidomyiidae) (CZAJKOWSKA 1978).

***Aphanogmus fulmeki* SZELÉNYI, 1940**

Forest Inspectorate of Brzesko, Małopolska Province: two specimens reared from *Larix decidua* MILLER, 1768 cones, parasitizing an *Asynapta laricis* SKRZYPCZYŃSKA, 1977 larvae (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1978).

***Aphanogmus gracilicornis* FÖRSTER, 1861**

Wielkopolska National Park, Wielkopolska Province: one specimen reared from a *Larix decidua* cone, parasitizing an *Asynapta laricis* larva (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1974).

Muszyna, Małopolska Province: one specimen reared from a *Larix decidua* cone, parasitizing an *Asynapta laricis* larva (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1974).

***Aphanogmus nanus* (NEES VON ESENBECK, 1834)**

Skierniewice, Łódź Province [as *Ceraphron nigriceps* (THOMSON, 1858)]: one specimen found on *Sambucus nigra* bordering an apple orchard (OLSZAK 1992).

***Aphanogmus steinitzi* PRIESNER, 1936**

Wielkopolska National Park, Wielkopolska Province: one specimen reared from a *Larix decidua* cone, parasitizing an *Asynapta laricis* larva (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1978).

Leżajsk, Podkarpackie Province: one specimen reared from a *Larix decidua* cone, parasitizing an *Asynapta laricis* larva (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1978).

***Aphanogmus strabus* DESSART, 1994 ***

Stawin, West Pomeranian (Zachodniopomorskie) Province: one specimen found on *Brassica napus* LINNAEUS, 1753 var. *napobrassica* (LINNAEUS) REICHENBACH, 1833 (DESSART 1994).

***Aphanogmus strobilorum* BAKKE, 1953**

Forest Inspectorate of Brzesko, Małopolska Province: one specimen reared from a *Larix decidua* cone, parasitizing an *Asynapta laricis* larva (Diptera: Cecidomyiidae) (SKRZYPCZYŃSKA 1978).

Experimental Forestry Unit in Krynica Zdrój, Małopolska Province: an unknown number of specimens reared from *Picea abies* (LINNAEUS) H. KARSTEN, 1881 (SKRZYPCZYŃSKA 1984).

***Aphanogmus tenuicornis* THOMSON, 1858**

Forest Inspectorate of Brzesko, Małopolska Province: four specimens reared from *Larix decidua* cone, parasitizing *Asynapta laricis* larva (Diptera: Cecidomyiidae). The identification of these specimens cannot have been correct because of the ambiguous original type description (SKRZYPCZYŃSKA 1978).

MEGASPILIDAE

***Dendrocerus aphidum* (RONDANI, 1877)**

Chylice, Mazowsze Province, Gołkowice, Opole Province and Czechów, Świętokrzyskie Province [As *D. bicolor* (KIEFFER, 1907)]: overall, 151 specimens of three Megaspilidae species in three localities were found parasitizing Aphidiidae (Hymenoptera) and Charipidae (Diptera) on *Medicago sativa* LINNAEUS, 1753 cultures (BAŃKOWSKA et al. 1975).

Locality not given: One specimen on *Brassica napus* and two specimens on *Triticum* spp. LINNAEUS, 1753 parasitizing Aphidiidae (Hymenoptera) (SOBOTA & GABRYŚ 1999).

Skierniewice, Łódź Province [as *D. bicolor* (KIEFFER, 1907)]: one specimen found on *Crataegus* sp. LINNAEUS, 1753 bordering an apple orchard (OLSZAK 1992).

Skierniewice, Łódź Province [as *D. breadalbimensis* (KIEFFER, 1907)]: one specimen found on *Euonymus* sp. LINNAEUS, 1753 bordering an apple orchard (OLSZAK 1992).

***Dendrocerus carpenteri* (CURTIS, 1829)**

Chylice, Mazowsze Province, Gołkowice, Opole Province and Czechów, Holy Cross Province: overall, 151 specimens of three Megaspilidae species in three localities were found parasitizing Aphidiidae (Hymenoptera) and Charipidae (Diptera) on *Medicago sativa* cultures (BAŃKOWSKA et al. 1975).

Huta Gruszczyno, Mazowsze Province: three specimens found as hyperparasitoids of *Aphis acetosae* LINNAEUS, 1761 (Hemiptera: Aphididae) (HAWRO & CERYNGIER 2006).

Bydgoszcz, Kujawsko-Pomorskie Province: 272 specimens found as hyperparasitoids of *Aphis fabae cirsiacanthoidis* SCOPOLI, 1763 (Hemiptera: Aphididae) on *Philadelphus coronarius* LINNAEUS, 1753 (BARCZAK & BŁAŻEJEWSKA 1992).

Las Piwnicki Nature Reserve and Dziki Ostrów Nature Reserve, Kujawsko-Pomorskie Province: found as parasitoids of *Trioxys pallidus* (HALIDAY, 1833) (Hymenoptera: Braconidae), hyperparasitoids of *Tuberculoides annulatus* (HARTIG, 1841) (Hemiptera: Aphididae) (BARCZAK 1994).

Łomianki and Dziekanów Leśny, Mazowsze Province: found as hyperparasitoids of *Rhopalosiphum padi* (LINNAEUS, 1758) (Hemiptera: Aphididae) and *Sitobion avenae* (FABRICIUS, 1775) (Hemiptera: Aphididae) (PANKANIN-FRANCZYK & CERYNGIER 1999).

Locality not given: 20 specimens on *Brassica napus* and 32 specimens on *Triticum* spp. parasitizing Aphidiidae (Hymenoptera) (SOBOTA & GABRYŚ 1999).

Łomianki, Mazowsze Province: 173 specimens found on *Hippophae rhamnoides* LINNAEUS, 1753 hyperparasitizing *Capitophorus hippophaes* WALKER, 1852 (Hemiptera: Aphididae); 19 specimens found on *Padus avium* MILLER, 1768 hyperparasitizing *Rhopalosiphum padi* (LINNAEUS, 1758) (Hemiptera: Aphididae); 30 specimens found on *Phragmites australis* (CAVANILLES) TRINIUS ex STEUDEL, 1799 hyperparasitizing *Hyalopterus pruni* (GEOFFROY, 1762) (Hemiptera: Aphididae); 254 specimens found on *Avena sativa* LINNAEUS hyperparasitizing *Sitobion avenae* (FABRICIUS, 1775) (Hemiptera: Aphididae) (CERYNGIER & PANKANIN-FRANCZYK 2001).

Midfield thickets around Bydgoszcz, Kujawsko-Pomorskie Province: 108 specimens reared as hyperparasitoids from *Aphis fabae* SCOPOLI, 1763 (Hemiptera: Aphididae) colonies on *Chenopodium* sp. LINNAEUS, 1753 (BARCZAK & DĘBEK-JANKOWSKA 2001).

Łomianki, Mazowsze Province: 1090 specimens reared as hyperparasitoids from *Sitobion avenae* (Hemiptera: Aphididae) (CERYNGIER & PANKANIN-FRANCZYK 2003).

Skierniewice, Łódź Province: one specimen found on *Caragana* sp. FABRICIUS bordering an apple orchard (OLSZAK 1992).

Grabówko, Kujawsko-Pomorskie Province: 4 specimens reared as hyperparasitoids of *Aphis fabae* SCOPOLI, 1763 (Hemiptera: Aphididae) living on *Euonymus europaea* LINNAEUS, 1753 (BARCZAK et al. 1999).

***Dendrocerus laticeps* (HEDICKE, 1929) ***

Pawłowice, Lower Silesian (Dolnośląskie) Province: found as a hyperparasitoid on winter wheat *Triticum* sp. (GABRYŚ & SOBOTA 1991).

Oleśnica Mała and Pawłowice, Lower Silesian (Dolnośląskie) Province: found as a hyperparasitoid on winter wheat *Triticum* sp. (SOBOTA 1992).

Łosiów, Opole Province: one specimen reared from the mummy of an aphid feeding on maize *Zea mays* LINNAEUS, 1753 (KRAWCZYK et al. 2009).

***Dendrocerus pupparum* (BOHEMAN, 1832)**

Chylice, Mazowsze Province, Gołkowice, Opole Province and Czechów, Świętokrzyskie Province [as *D. puparum* (BOHEMAN, 1832)]: overall, 151 specimens of three Megaspilidae species in three localities were found parasitizing Syrphidae (Diptera: Brachycera) (BAŃKOWSKA et al. 1975).

***Lagynodes pallidus* (BOHEMAN, 1832) ***

Forest Inspectorate of Jędrzejów, Świętokrzyskie Province: two females reared from a puparium of *Apanteles congestus* (NEES VON ESENBECK, 1834) (Hymenoptera: Braconidae), which was parasitizing *Eurois occulta* (LINNAEUS, 1758) (Lepidoptera: Noctuidae) on *Vaccinium myrtillus* LINNAEUS, 1753 (KARCZEWSKI 1962). Examination of the Karczewski collection in MIZ confirmed the species' identification.

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