

The Swedish species of *Cidaphus* (Hymenoptera, Ichneumonidae, Mesochorinae), a new genus and three new species for Sweden

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Ryrholm, N., Johansson, N. & Shaw, M.R.: The Swedish species of *Cidaphus* (Hymenoptera, Ichneumonidae, Mesochorinae), a new genus and three new species for Sweden. [De svenska arterna av brokparasitstekelsläktet *Cidaphus* (Hymenoptera, Ichneumonidae, Mesochorinae), ett nytt släkte och tre nya arter för Sverige.] – Entomologisk Tidskrift 138 (3-4): 203-208. Uppsala, Sweden 2017. ISSN 0013-886x.

The ichneumonid genus *Cidaphus* Förster, 1869, and its three known European species *Cidaphus areolatus* (Boie, 1850), *C. alarius* (Gravenhorst, 1829) and *C. atricillus* (Haliday, 1839) are reported as new to Sweden based primarily on specimens collected in light traps during projects monitoring nocturnal moths. The available material indicates that *C. areolatus* is a rather abundant and widespread species throughout most of the southern and central parts of Sweden. The trapping data indicates that it flies in one prolonged generation from July until October. *Cidaphus atricillus* and *C. alarius* are both rather rare and their distribution is much less clear, but both species appear to fly earlier in the season than *C. areolatus*.

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Cidaphus Förster, 1869, is a small genus in the ichneumonid subfamily Mesochorinae. All mesochorines are presumed to be solitary koinobiont secondary endoparasitoids. The majority develop as parasitoids of primary koinobiont Ichneumonoidea (Hymenoptera) parasitizing Lepidoptera, Symphyta (Hymenoptera) and more rarely Coleoptera, Heteroptera and Psocoptera. Less commonly Tachinidae (Diptera) may be the primary parasitoid. “Koinobiont” is the term used for a parasitoid that develops on, or in, a still-active host. In general, mesochorines parasitize endoparasitoids, but some groups of koinobiont ectoparasitoids are also susceptible (Shaw, 1983). Because the host of the mesochorine is attacked while it is itself developing in or

on its own host, mesochorines are termed “true hyperparasitoids”. This distinguishes them from “pseudohyperparasitoids” which time their attack on primary parasitoids solely after the latter have ceased feeding (and in the case of ichneumonoids, typically have made their cocoon). Mesochorines develop as koinobionts and finally kill their host after it has made its cocoon, from which the adult mesochorine emerges in due course.

By far the largest genus in this subfamily is *Mesochorus*, and the developmental biology of that genus is fairly well understood through studies on several species. However, little is known in detail of the biology of the other genera, including *Cidaphus*. Most *Cidaphus* species are quite



Figure 1. *Cidaphus alarius* (Gravenhorst, 1829), female, where the broad ovipositor sheaths are clearly visible at the tip of the abdomen. Photo: Niklas Johansson.

Cidaphus alarius (Gravenhorst, 1829), hona med den typiska slanka kroppsbyggnaden för arter av släktet *Cidaphus*. De karakteristiska formade breda skydden för det tunna äggläggningröret syns tydligt i bakkroppsspetsen. Foto: Niklas Johansson.

large with fore wing lengths usually 8.5–13 mm, though smaller specimens may occasionally occur. Their orange colouring and slender legs and bodies makes them superficially similar in appearance to nocturnal representatives of other ichneumonid genera such as *Ophion* and *Netelia*. *Cidaphus* can be easily distinguished from them by the large rhomboid areolet (arrowed in Fig. 2) in the fore wing. Further, at the tip of the abdomen the females have relatively wide ovipositor sheaths enclosing a slender needle-like ovipositor (Fig. 1) and the males have fine elongate parameres (genital claspers; Fig. 2).

At the moment the genus contains 20 de-

scribed species worldwide (Yu et al., 2012) of which 3 are known from Europe (de Jong et al., 2014). Watanabe (2015) provides an illustrated key which covers the European species. An earlier key by Fitton (1985) treats *C. areolatus* under its the junior synonym *C. brischkei* (Szépligeti, 1911). Fitton summarises various Lepidoptera secondary hosts, and primary ichneumonid hosts that include *Dusona* and *Banchus* species, as well as some Tachinidae taken from literature records (which are of unknown reliability). Schwenke (1999) also provides a key, but the names used have to be corrected according to Horstmann (2002). In this paper the genus *Cidaphus* and its three European species, *Cidaphus areolatus* (Boie, 1850), *C. alarius* (Gravenhorst, 1829) and *C. atricillus* (Haliday, 1839), are reported new to Sweden. The distribution of these species in Sweden is briefly compared with the known situation in Britain, based on the NMS and BMNH collections and the distribution scheme for nocturnal Ichneumonoidea run by Gavin Broad. See also Broad (2016).

Material and Methods

The study material was mainly collected by light traps in the project for monitoring nocturnal Lepidoptera run by Nils Ryrholm and Clas Källander; in the list that follows such specimens are indicated “R/K”. These traps are operated in most years from May to November, and even December in southernmost Sweden, with the exception of Härjedalen and Jämtland where trapping normally ceases at the beginning of September. Additional material was provided by private collectors. We also studied specimens deposited in the Biologiska Museet (MZLU), Lund; the Naturhistoriska Riksmuseet (NHRS), Stockholm; and the National Museums of Scotland (NMS), Edinburgh. No Swedish material is present in the Natural History Museum (BMNH), London (Gavin Broad, pers. comm.) or Evolutionsmuseet, Uppsala (Hans Mejlon, pers. comm). Specimens presented in the study were determined by the second author except for specimens deposited in the NMS, which were determined by the third author. All studied specimens are kept at the NHRS unless otherwise stated below.



Figure 2. *Cidaphus areolatus* (Boie, 1850), male, where the fine elongate parameres are clearly visible at the tip of the abdomen. The Arrow points at the characteristic rhombic areolet in the fore wing which distinguish *Cidaphus* from superficially similar species in other subfamilies. Photo: Niklas Johansson.

Cidaphus areolatus (Boie, 1850), hane. I bakkroppsetsen syns de speciellt formade tunna och spetsiga genitalklafarna (paramerer) som är typiska för släktet. Pilen visar på det rombiska fältet i framvingen som skiljer släktet *Cidaphus* från skenbart liknande arter inom andra familjer. Foto: Niklas Johansson.

Cidaphus areolatus (Boie, 1850)

Hr: Sveg, Duvberg 1♀ 16.vii-12.viii.2004 (R/K, NMS), 1♂ 23.viii-5.ix.2008 (R/K, NMS), 1♀ 11.vi-27.viii.2016 (R/K); **Gä:** Grinduga 1♀ 10.ix-17.ix.2013 (R/K); **Up:** Lidingö, Brevik 1♀ 16.vii.1933 (René Malaise, NHRS), Häverö 1♀ 1.ix-4.ix.2016 (R/K), Rådmansö 7♀/1♂ 10.x-15.xi.1997 (R/K), Rådmansö, Bergholmen 5♀ 23.v-6.xi.2005 (R/K, NMS), 1♀ 14.viii-7.ix.2016 (R/K), 3♀ 8.ix-15.x.2016 (R/K), Rådmansö, Strömsborg 1♀ 14.viii-7.ix.2016, 1♀ 29.vii-9.ix.2017 (R/K), Uppsala, Husbyborg 2♀ x.2005 (R/K, NMS), Vaddö Skjutfält 4♀ 4.ix-16.x.2016 (R/K); **Sö:** Nynäshamn, Lilla Grönvik, 1♂ 1.v-1.viii.2006 Window trap (Håkan Andersson); Nynäshamn, Marsudden, 1♂ 1.v-1.viii.2006 Window trap (Håkan Andersson); **Bo:** Tossene, Stora Hultet, 1♀ 24.viii-18.x.2012 (R/K, NMS), 1♀

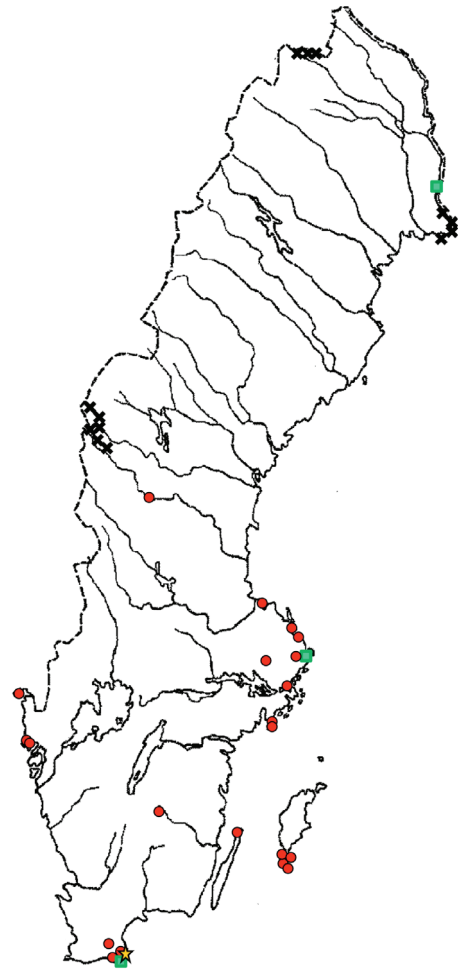


Figure 3. Distribution of *Cidaphus* finds in Sweden. Red dot: *C. areolatus*, green square *C. atricillus* and yellow star *C. alarius*. Black crosses shows trapping positions which have not captured any *Cidaphus*.

Hittills kända fynd av *Cidaphus* i Sverige: röd punkt *C. areolatus*, grön kvadrat *C. atricillus* och gul stjärna *C. alarius*. Svarta kryss visar fällpositioner som aldrig fångat några *Cidaphus*.

24.vii-9.ix.2014 (R/K), 1♀ 31.viii-27.x.2016 (R/K), Tossene, Åby 2♀ 28.viii-18.x.2012 (R/K, NMS), 2♀ 14.viii-21.xi.2013 (R/K, NMS), 4♀ 31.viii-27.x.2016 (R/K); Nordkoster, Dunnaslätten 4♀ 3.ix-1.x.2006 (R/K, NMS), 1♀ 8.x-20.xi.2006 (R/K, NMS); **Sm:** Vetlanda, Drags udde, 1♀ 1.vi-1.viii.2012 Malaise trap (Niklas Johansson); **Go:** Hamra, Tuvlandet 1♀

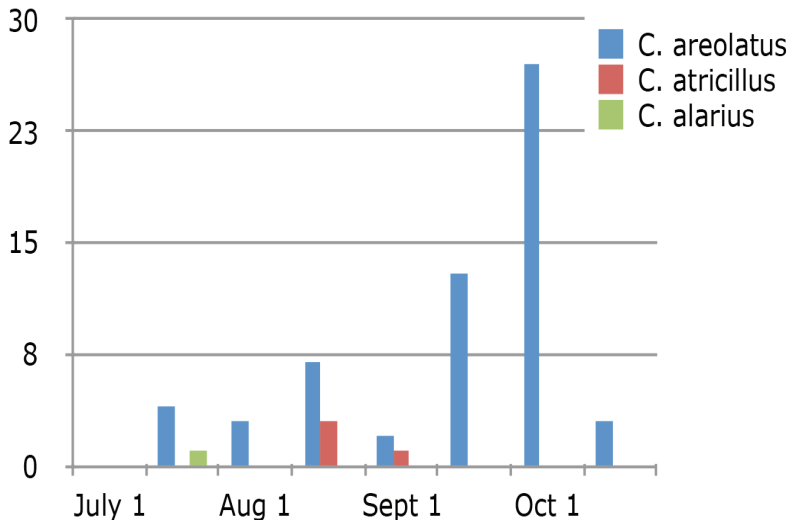


Figure 4. Approximate phenology of the *Cidaphus* finds in Sweden. Each month is divided into two halves and each find is placed in the part of the month which mostly covers the trapping period for the specimen. Finds with very imprecise capture dates are not included.

Ungefärliga flygtider för de svenska fynden av *Cidaphus*. Varje månad är indelad i två delar och fynden är placerade i den månadsdel som bäst matchar observationsperioden för varje observation. Fynd med mycket långa observationsperioder har utelämnats.

9.ix-14.x.2005 (R/K), Hamra, Suders 1♀ 28.vii-25.viii.2008 (R/K), Sundre, Barrshage 1♀ 27.viii-24.ix.2007 (R/K), Sundre Holmhällar, 1♀ 26.ix-16.x.1995 (R/K), Öja, Petesviken 4♀ 5.x.2013 (R/K, NMS), Öja, Gisle 1♀ 29.ix-23.x.2007 (R/K); **Öl:** Borgholm, Byxelkrok, Hälludden, 1♀ 22-24.ix.2017. (Robin Isaksson); **Sk:** Blentarp, Stampen 1♀ 23-24.ix.1969 (Bo W. Svensson, MZLU), Löderup, Järahusen 2♀ 8.viii-28.viii.1997 (R/K), 1♀ 1.ix-31.ix.1995 (R/K); Ö Hoby, Sprageghusen 1♀ 26.vii-25.viii.2006 (R/K, NMS), 1♂ 27.v-28.vii.2016 (R/K);

Comment. Altogether we have found 60 specimens of *Cidaphus areolatus* in the available material. It is evidently a rather common and widespread species in southern and central Sweden but becoming rarer towards the north and it is apparently absent along the mountain range and in the northernmost parts of Sweden (Fig. 3). Significantly, none of the traps run at Abisko and along the Torne valley have captured this species. Since the traps were operating from approximately May until November in southern and central Sweden it is clear that the species is mainly active during late summer and autumn (Fig. 4) in what appears to be one prolonged generation, with no indication of any spring or early summer generation. Unsurprisingly, there is a tendency for an earlier start to the flight period in Skåne than further north. The late flight time in combination with the species

presumably being strictly nocturnal might have contributed to the lack of previously published records and lack of finds from many parts of Sweden. *C. areolatus* appears to occur in a range of mostly wooded habitats from taiga forests to rich deciduous woodlands, but a few of the captures are from more open areas. In Britain it is primarily a northern species, and well represented from Scotland in the NMS collection.

Cidaphus alarius (Gravenhorst, 1829)

Sk: Ö Hoby, Sprageghusen, 1♀ 27.v-28.vii.2016 (R/K).

Comment. On the basis of a single record this is evidently a very rare species with a presumed southern distribution in Sweden. The sudden appearance of a single female at a coastal locality (Fig. 5) 2016 in southern Sweden, where light trapping has been conducted for more than 20 years, might indicate recent colonisation. However, further sampling will be needed to clarify its status in Sweden. In Britain it has a southern distribution and it has not been found in Scotland.

Cidaphus atricillus (Haliday, 1839)

Nb: Soukolojoki, Övertorneå 1♀ 7.viii-10.x.2016 (R/K); **Up:** Rådmansö, Strömsborg 1♀ 14.viii-7.ix.2016 (R/K); **Sk:** Hagestad, Järahusen 1♀ 1.ix-31.ix.1995 (R/K), 1♀ 8.viii-31.viii.1997 (R/K).



Figure 5. The sandy coastal habitat where the first and so far only Swedish specimen of *Cidaphus alarius* was found in Sweden. Photo: Nils Ryrholm.

Strandhabitatet där det första fyndet av *Cidaphus alarius* i Sverige gjordes. Foto: Nils Ryrholm.

Comment. An apparently rare species which has been recorded from the far north of Sweden as well as one locality at the southern tip of the country and a single locality in between (Fig. 3). It may have a Baltic distribution in Sweden which is a fairly common biogeographical pattern. In Britain it has a similarly extensive north-south occurrence but in that case a rather western, perhaps Atlantic, distribution (though it is not known from Ireland). In Wales *C. atricillus* has been reared from the nocturnal ophionine ichneumonid *Enicospilus ramidulus* (Linnaeus) reared from the noctuid moth *Ceramica pisi* (Linnaeus) (NMS).

Discussion

Considering the relatively well studied ichneumonid fauna of Sweden, and the ease of recognising the genus, it is remarkable that there has been no formally published record of *Cidaphus* from Sweden up to the present date. This is par-

ticularly so regarding *C. areolatus* which seems to be a rather common and widespread species in southern and central Sweden (Fig. 3). A plausible explanation is the late period of occurrence of the adults and the species being exclusively nocturnal. In this respect there has been a dramatic increase in specimens recorded since the widespread use of Mercury Vapour light traps, which have been the source of most of the material presented in this study. Especially the light trapping project run by Nils Ryrholm and Clas Källander during almost 35 years is, by collecting and preserving parasitic wasps, providing invaluable material that will change knowledge on geographic distribution, frequency and to some extent the ecology of many nocturnal species. This trapping project, mainly focusing on nocturnal Lepidoptera, demonstrates how a well-conducted study can contribute to our knowledge to an extent far wider than initially intended.

Acknowledgements

We would like to thank Hege Vårdal at the NHRS at Stockholm, Christer Hansson and Rune Bygebjerg at MZLU at for access to specimens under their care. Gavin Broad kindly informed us on the status of Swedish *Cidaphus* in the NHM and Hans Mejlon provided information from the collections at Evolutionsmuseet in Uppsala. Mattias Forshage for discussions on the Swedish *Cidaphus*. Håkan Andersson (Linköping) gave access to his rich material of ichneumonids collected by window traps plus Robin Isaksson and Clas Källander for collecting captured wasps.

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Sammanfattning

I denna artikel presenteras de nu i Sverige funna arterna av det nattaktiva brokparasitstekelsläktet *Cidaphus*. En genomgång av museisamlingar, privata samlingar och i synnerhet det rika material som insamlats av Nils Ryrholm och Clas Källander i samband med övervakning av nattfjärilar visade att samtliga tre kända europeiska arter i släktet förekommer i Sverige trots att ingen av arterna hittills formellt rapporterats från landet. Av de tre arterna förefaller *Cidaphus areolatus* vara tämligen allmän och utbredd i Götaland, Svealand och södra Norrland men saknas i fjällvärlden och längst i norr. De båda övriga arterna *C. atricillus* och *C. alarius* är att betrakta som sällsynta och lokalt förekommande. Detta gäller särskilt *C. alarius* som endast är känd genom en hona insamlad i sydöstligaste Skåne vid Spraggehusen 2016. De få fynden av *C. atricillus* indikerar att arten kan ha en utbredning som har sin tyngdpunkt i landskapen längs Östersjön och Bottenhavet, men fler fynd behövs för att vi skall få bättre kunskap om arten. Fynden av flera förut ej kända arter från Sverige visar även på värdet av de möjligheter till systematisk insamling av nattaktiva insekter och kunskaper om dessa som ljusfällfångst kan erbjuda.