

# Nineteen species of gall midges (Diptera: Cecidomyiidae) new to Denmark

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## Abstract

We report the first records to Denmark of nineteen gall midge species: *Anabremia bellevoeyi*, *Bayeriola thymicola*, *Contarinia asclepiadis*, *Dasineura virgaeaureae*, *Lestodiplosis achilleae*, *Lestodiplosis chrysanthemi*, *Lestodiplosis cirsii*, *Lestodiplosis coni*, *Macrolabis achilleae*, *Ozirhincus millefolii*, *Rhopalomyia baccarum*, *Tricholaba viciarum*, *Trotteria ligustri*, *Zeuxidiplosis giardi* and three species of *Contarinia* only determined to the genus level. With the reported records, the Danish gall midge fauna comprises 302 named species and 24 species identified to the genus level only. Of these, 87 have been found during the last decade, the largest number of new species to Denmark ever reported for a ten year period. However, the fact the few individuals have made these findings at a limited number of sites strongly suggest that the Danish gall midge fauna still is very incompletely known.

## Dansk sammendrag

Vi fremlægger dokumentation for fund af 19 nye arter af galmyg for Danmark, nemlig *Anabremia bellevoeyi*, *Bayeriola thymicola*, *Contarinia asclepiadis*, *Dasineura virgaeaureae*, *Lestodiplosis achilleae*, *Lestodiplosis chrysanthemi*, *Lestodiplosis cirsii*, *Lestodiplosis coni*, *Macrolabis achilleae*, *Ozirhincus millefolii*, *Rhopalomyia baccarum*, *Tricholaba viciarum*, *Trotteria ligustri*, *Zeuxidiplosis giardi* samt tre arter som kun har kunnet bestemmes til slægten *Contarinia*. Med de nye arter udgør Danmarks galmygfauna 302 kendte arter samt 24 arter hvis identitet kun kendes på slægtsniveau. Af disse arter er 87 erkendt i løbet af de seneste årti, hvilket er det højeste antal nye arter i noget tiår nogensinde, inklusive Rostruppernes storhedstid i 1890'erne. Alt tyder dog på at Danmarks galmygfauna forsat er meget ufuldstændigt kendt.

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During the last decade, the Danish fauna of gall midges has undergone renewed investigation. During the years 2000 through 2011, a total of 94 named species have been recorded as new to the country (Fig. 1). A milestone in the process was the 2006 special issue of Entomologiske Meddelelser (Skuhrová et al. 2006), in which 73 new species were reported. Here, we report another 16 identified species not recorded previously (Henriksen 1944, Jensen 1962, Skuhrová 2005, Skuhrová et al. 2006, Jørgensen 2009, Bruun & Skuhrová 2011). In addition, we report 3 new species so far identified to the genus level only.

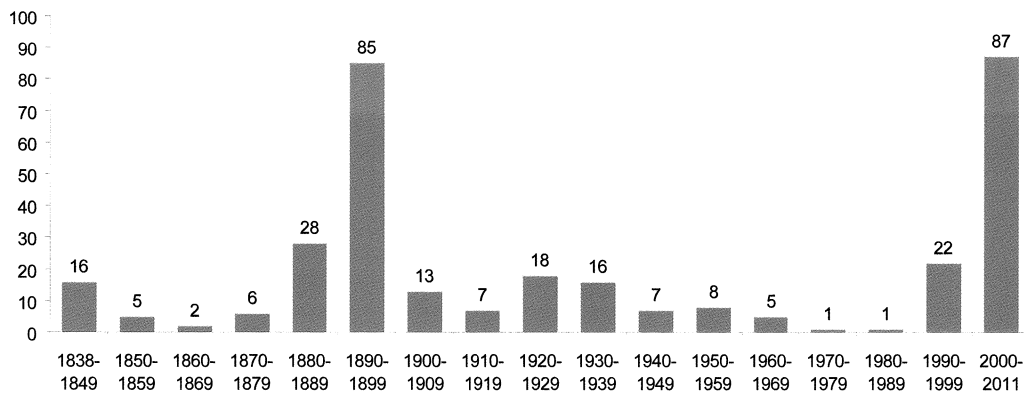


Fig. 1. Number of newly recorded Cecidomyiid species per decade 1838–2011, mainly based on Skuhrová et al. (2006), with new records since 2003 amended by JJ (NB the oldest and the most recent periods comprise 12 years each).

Fig. 1. Antallet af nyfundne arter af galmyg per tiår i perioden 1838–2011, hovedsageligt baseret på Skuhrová et al. (2006), men med nye fund siden 2003 tilføjet af JJ (bemærk at den ældste og den yngste periode hver består af 12 år).

Some host plants have received particular attention. The two Danish species of *Achillea*, *A. millefolium* and *A. ptarmica*, are in places very abundant on Læsø and their gall midge fauna has been made object to intensive studies. Prior to these studies, two species of *Rhopalomyia* were known on this host genus (Henriksen 1944). The early Læsø studies resulted in records of another species of *Rhopalomyia* and two species identified to the genus level, one *Contarinia* and one *Jaapiella* (Skuhrová et al. 2006). Investigations after 2006 have led to the identification of *Macrolabis achilleae* Rübssamen, *Ozirhincus millefolii* (Wachtl) and *Lestodiplosis achilleae* Barnes.

#### *Anabremia bellevoeyi* (Kieffer, 1896)

Larvae live asinquilines in axillary bud galls of *Lathyrus pratensis* (Fabaceae) jointly with larvae of the gall-causer *Dasineura lathyricola* (Rübssamen, 1890) – see Fig. 2. Galls were collected at Kokvad, Læsø 28-07-2005 and contained 94 yellow-red larvae of *D. lathyricola* and seven smaller yellow larvae of *Anabremia bellevoeyi*. Emergence of adults followed in May-June the following year (1 male + 1 female). The distribution of this species is known to comprise France, Germany, UK, Poland, Latvia, Czech Republic and Slovakia (Skuhrová 1986). Its closest known occurrence is in Mecklenburg-Vorpommern in Germany (Pichinot & Meyer 1998) and the find may be the northernmost occurrence of the species.

NEJ: Læsø, Kokvad, 2005 (57°14'50"N 11° 0'14"E), leg. J. Jørgensen, det. M. Skuhrová.

#### *Bayeriola thymicola* (Kieffer, 1888)

Red larvae produce terminal or axillary rosette galls on *Thymus serpyllum* L. and *T. pulegioides* L. (Lamiaceae) – see Fig. 3. Despite extensive search in populations of both host species, galls have been found at one site only, on *Thymus serpyllum*.

NEZ: Roskilde: Flækkebakke, Ejby Ådal (55°42'15.7"N 11°50'30.6"E), 12-08-2011, old species-rich grassland on calcareous coastal slope, leg. H.H. Bruun & Rasmus Ejrnæs, det. M. Skuhrová.

In Central Europe, this species has several generations per year and the larvae pupate in the galls in white cocoons. It is a widely distributed species, known to occur in 20



Fig. 2. Galls induced by *Dasineura lathyricola* in axillary buds and stipules of *Lathyrus pratensis*, in which larvae of *Anabremia bellevoeyi* live asinquilines. Ordrup Strand, 27-07-2012, photo HHB.

Fig. 2. Galler af *Dasineura lathyricola* i sideknopper og fortykkede fodflige på gul fladbælg (*Lathyrus pratensis*). I disse lever larverne af *Anabremia bellevoeyi* som inkviliner. Ordrup Strand, 27-07-2012, foto HHB.

European countries and also in Morocco and Tunisia in North Africa (Skuhrová 1986). In South Tyrol (northern Italy) the galls have been found at altitudes from 1 900 up to 2 510 m a.s.l. (Skuhrová & Skuhrový 2010). Based on zoogeographical analysis of Central Europe, it is estimated to be a declining species (Skuhrová 1994a, 1994b). In the Czech Republic it is considered critically endangered (Skuhrová 2005). The species occurs in both Schleswig-Holstein and in Sweden (Andersson 1958, Pichinot & Meyer 1998), so the new Danish record fills a distributional lacuna. The site of encounter is a focal site for remnant populations of many rare species, so – probably – *B. thymicola* is not a recent colonizer, but a truly rare species.

#### *Contarinia asclepiadis* (Giraud, 1863)

The white larvae live gregariously as seed predators in immature capsules of its single host plant *Vincetoxicum hirsutinaria* Medik. (Apocyanaceae) – see Fig. 4. It does not induce true galls. The attacked seed pods may be recognized by being slightly stunted, curved and with dark spots. Only one generation develops per year. The species was found at the following site and larvae retrieved from capsules confirmed the identity.



Fig. 3. Galls of *Bayeriola thymicola* in apical buds of *Thymus serpyllum*. Ejby Ådal, 12-08-2011 (photo HHB).

Fig. 3. Galler af *Bayeriola thymicola* i skudspidser af smalbladet timian (*Thymus serpyllum*). Flækkebakke, Ejby Ådal, 12-08-2011 (foto HHB).

NEZ: Skibby, Skuldelev Ås, south of Skuldelev Havn (55°47'23.16"N 12° 3'12.57"E), 02-08-2011, xerothermic coastal slope, leg. H.H. Bruun, det. M. Skuhrová.

In some of the fruits, the species seemed to live together with a much larger solitary larva of the tephritid fly *Euphranta connexa* (Fabricius, 1794), also a monophagous seed predator of *Vincetoxicum hirsutinaria*. *C. asclepiadis* was recorded in northern Germany by Kröber (1956) and is further found in Thüringen (Jaap 1925) and Saxony (Buhr 1966). Its overall distribution comprises Austria, Germany, the Netherlands, the Czech Republic (only one locality, Kotouc Hill near Stramberk, 529 m a.s.l., Skuhrová 1994b), and Sweden (Skuhrová 1986). In Sweden, it is distributed from Uppland down to the island of Öland and has been subject to detailed studies (Widenfalk et al. 2002). In connection with these, the species was sought for in Denmark, but at that time in vain. Probably, it is not a recent immigrant, but a genuinely rare species.

#### *Contarinia* sp. 1

Pale orange larvae, a few together, seemingly tunnelling brown tissue in the cupulus of stunted young acorns of *Quercus robur* (Fagaceae). The cupuli are often star-like or irregularly splitting – see Fig. 5. At least some of the acorns were galled by the gall wasp *Andricus legitimus* Wiebes-Rijks, 1979. This gall wasp causes acorns to be deformed and pupates in an egg-shaped inner gall. The cecidomyid larvae may be inquiline of the cypripid galls, but that remains to be investigated. Wiebes-Rijks (1979) does not mention



Fig. 4. Larvae of *Contarinia asclepiadis* sucking sap from developing seeds in slightly stunted immature capsules of *Vincetoxicum hirsutaria*. Skuldelev Ås 02-08-2011, photo HHB.

Fig. 4. Larver af *Contarinia asclepiadis* som suger saft af umodne frø i let deformerede kapsler af svalerod (*Vincetoxicum hirsutaria*). Skuldelev Ås 02-08-2011, photo HHB.

Fig. 5. Young acorn and cupulus of *Quercus robur* deformed by *Contarinia* sp. 1. Kårup Skov, 14-07-2011, photo HHB.

Fig. 5. Ungt agern af stilk-eg (*Quercus robur*) med agernskål deformeret af *Contarinia* sp. 1. Kårup Skov, 14-07-2011, foto HHB.

encountering any cecidomyid larvae in her thorough investigations of the gall wasp in Holland. She does mention, however, that galls of *A. legitimus* are very often taken over by *Synergus clandestinus* Eady 1952, which completely changes the appearance of galls. One may speculate that the frequency of this cynipid inquiline in the Netherlands may limit the occurrence of the here described cecidomyid. Galls of the described appearance have been found at two sites separated by ca. 70 km, so the species may have a wider distribution within Denmark:

NWZ: Fårevejle, Kårup Strand (55°49'16.64"N 11°22'57.05"E), 10-07-2011, forested leisure cottage area, leg. H.H. Bruun.

SZ: Køge, Odden (55°25'33.74"N 12°13'5.13"E), 03-08-2011, solitary oak tree at river estuary, leg. H.H. Bruun.

#### *Contarinia* sp. 2

White jumping larvae were found gregariously between intact cupulus and acorn of *Quercus robur* (Fagaceae) – see Fig. 6. All acorns seemed to be more or less damaged by the tortricid moth *Cydia splendana* Hübner, 1799. Barnes (1955) reared gall midges from acorns and cupuli collected in England. His finds included specimens of the mainly phytophagous genus *Contarinia*, but he did not describe any species. The reported find may belong to one of Barnes' undescribed species.



Fig. 6. Immature acorn of *Quercus robur* damaged by *Cydia splendana* and with larvae of *Contarinia* sp. 2. Assistens Kirkegård, 25-08-2010, photo HHB.

Fig. 6. Umodne agern af stilk-eg (*Quercus robur*) beskadiget af agernvikler (*Cydia splendana*) og med larver af *Contarinia* sp. 2. Assistens Kirkegård, 25-08-2010, foto HHB.

Fig. 7. Larvae of *Contarinia* sp. 3 on leaves of *Vaccinium uliginosum*. On the upper side, a discoloured upward bulge is apparent. Nørholm Hede, 30-06-2011, photo HHB.

Fig. 7. Larver af *Contarinia* sp. 3 på misdannede og misfarvede blade af mosebølle (*Vaccinium uliginosum*). Nørholm Hede, 30-06-2011, foto HHB.

NEZ: Copenhagen, Assistens Kirkegård (55°41'32.04"N 12°33'1.02"E), 25-08-2010, old park-like urban cemetery, leg. H.H. Bruun.

#### *Contarinia* sp. 3

Orange larvae live gregariously in a drop of liquid in an upward bulge on leaves of *Vaccinium uliginosum* (Ericaceae). In light-exposed leaves, the bulge is surrounded by a reddish-yellowish zone (Fig. 7). The larvae and galls were collected at one site:

WJ: Nørholm Hede (55°40'37.72"N 8°36'21.06"E), 30-06-2011, old mesic heathland, leg. H.H. Bruun.

Unfortunately, attempts to keep larvae on excised twigs in glass jars resulted in very fast larval death, despite plenty of plant and insect material. Previously, the third author has collected the same species in the Czech Republic (Knížecí Pláne in the national park Sumava) and in northern Italy (Gadertaler Dolomiten in South Tyrol; Skuhrová & Skuhrový, 2010). Galls of similar appearance on *Vaccinium* ssp. have been recorded from high alpine situations in western North America (Gagné 1989), so it may be a Holarctic, more or less alpine species.

*Dasineura virgaeaureae* (Liebel, 1889)

Larvae develop in galls on vegetative tips and in flower heads of *Solidago virgaurea* (Asteraceae). In Denmark the larvae were found in faded capituli and adults were reared from these. The colour of the larvae ranged from whitish to orange, which is in accordance with Liebel's original description of larval development. In Central Europe, the species apparently has two or more generations – the first generation inducing bud galls on stems or at vegetative tips, while the second generation lives in flower heads. No galls were found at the Danish collection site, but that could be due to the late time of season. The species is widely distributed in Europe (Skuhrová 1986) with the range extending to Kazakhstan (Fedotova, 2000) and has been previously found in both Schleswig-Holstein and in Sweden. Like its host plants, it has a wide latitudinal and altitudinal distribution – in the Alps (South Tyrol) it ranges from 700 to 2150 m a. s. l. (Skuhrová & Skuhrový, 2010).

NWZ: Fårevejle, Rævehjerg (55°48'8.76"N 11°23'25.54"E), 17-09-2011, old unimproved grassland, leg. H.H. Bruun.

*Lestodiplosis achilleae* Barnes, 1928.

Larvae prey on larvae of *Macrolabis achilleae* in flower heads of *Achillea ptarmica* (Asteraceae). Elsewhere, this species is known only from the type locality in Kent (England) (Barnes 1928) and from one site in the Czech Republic (Skuhrová 2006).

NEJ: Læsø, Klitten, 2004 (57°17'8"N 11°3'41"E), leg. J. Jørgensen, det. M. Skuhrová.

*Lestodiplosis chrysanthemi* Kieffer, 1913.

Larvae feed zoophagously on other small insects in flower heads of *Leucanthemum vulgare* (Asteraceae). This species is known from France, England and the Czech Republic (Skuhrová 2006).

NEJ: Læsø, Klitten, 2005 and 2008 (57°17'8"N 11°3'41"E), leg. J. Jørgensen, det. M. Skuhrová.

*Lestodiplosis cirsii* Barnes, 1928

According to Barnes (1928), the larvae of *L. cirsii* are predators of *Macrolabis cirsii* in flower heads of *Cirsium arvense* (Asteraceae). In Denmark adults were reared from *Cirsium arvense* capituli. It is known to occur in British Isles, the Netherlands and Italy (Skuhrová & Skuhrový (2003, 2007).

NEJ: Læsø, Klitten, 2005 and 2011 (57°17'8"N 11°3'41"E), leg. J. Jørgensen, det. M. Skuhrová.

*Lestodiplosis conii* (Kieffer, 1930).

Red larvae live freely between the scales of the cones of *Picea* (Pinaceae), usually *P. abies*, and pupate there in white cocoons (Barnes 1951). This species is known from southern Germany and Hungary (Skuhrová 1986). In Denmark, the larvae were found under the scales in the cones of *Picea sitchensis* at one site:

NEJ: Læsø, Klitten, 2004 (57°17'8"N 11°3'41"E), leg. J. Jørgensen, det. M. Skuhrová.

*Macrolabis achilleae* Rübsaamen, 1893

Yellow larvae has been recorded from capituli of *Achillea ptarmica* (Asteraceae), but so far only one male has been reared (in 2005). Attacked flower heads are not conspicuously deformed. This species is known from Germany, England, Russia, Latvia and the Czech Republic (Skuhrová 1986, 2006). The usual host plant is usually *A. millefolium* (Asteraceae).

NEJ: Læsø, Klitten, 2005 (57°17'8"N 11°3'41"E), leg. J. Jørgensen, det. M. Skuhrová.



Fig. 8. Fleshy galls of *Rhopalomyia baccharum* on the root collar of *Artemisia vulgaris*. Sundet, Fåborg, 09-07-2011, photo Gunnar Knudsen.

Fig. 8. Kødede galler af *Rhopalomyia baccharum* på rodhalsen af grå-bynke (*Artemisia vulgaris*). Sundet, Fåborg, 09-07-2011, photo Gunnar Knudsen.

*Ozirhincus millefolii* (Wachtl, 1884)

Solitary orange larva was found developing inside maturing fruits (achenes) of *Achillea ptarmica* (Asteraceae) in 2004. During the years 2004, 2005 and 2009, about 140 adult midges have been reared. The species does not induce a conspicuous gall, but rather a slight swelling of the fruit – in any case, much less pronounced than the galls of *O. tanacetii* in fruits of *Tanacetum vulgare*. The species is widely distributed in Europe and the Palaearctic in general. It has been imported to the Nearctic Region as a biocontrol agent (Skuhravá 1986). Its usual host is *A. millefolium* (Asteraceae), but in Denmark, it has only been recorded from *Achillea ptarmica*.

NEJ: Læsø, Klitten, 2004 (57°17'8"N 11° 3'41"E), leg. J. Jørgensen, det. M. Skuhravá.

*Rhopalomyia baccharum* (Wachtl, 1883)

Orange coloured larvae produce fleshy galls on the stem of *Artemisia vulgaris* (Asteraceae). The typical galls are made in buds on the base of the main stem at or near to the soil surface (Fig. 8). These galls are 2-10 mm across, rounded or sometimes confluent, hard



and with a slightly cracked surface. Smaller and softer galls may be found further up the stem, in axillary buds. The galls of this species were found in East Jutland by Erik Nielsen, who put photographs of the galls of the Danish citizen science forum Fugleognatur.dk. Soon thereafter, the first author found similar galls at sites in Zealand. Adult males and females were reared from galls collected at the following three sites:

EJ: Silkeborg: Buskhede, Kragelund (56°10'47.93"N 9°25'43.14"E), 28-06-2011, farmland, leg. Erik Nielsen.

NEZ: Copenhagen, De gamles By (55°41'46.60"N 12°33'34.33"E), 07-07-2011, wasteland in urban park, leg. H.H. Bruun.

NWZ: Fårevejle, Næsskov (55°49'19.37"N 11°23'6.07"E), 10-07-2011, road verge between mixed forest and leisure cottage area, leg. H.H. Bruun.

In all cases adults emerged within a few days of gall collection, which suggests that the species may have more than one generation per year in Denmark.

The mentioned finds spurred further search for the species by interested people and the efforts resulted in further records (personal communication via Fugleognatur.dk):

NWZ: Fårevejle, Disbjerg (55°49'43.27"N 11°26'0.51"E), 12-07-2011, verge of tarmac road, leg. H.H. Bruun.

NWZ: Fårevejle, Orhøje (55°48'37.34"N 11°23'33.39"E), 18-07-2011, verge of gravel road, leg. H.H. Bruun.

NWZ: Fårevejle, Rævebjerg (55°48'8.76"N 11°23'25.54"E), 17-07-2011, verge of gravel road, leg. H.H. Bruun.

NWZ: Fårevejle, Ordrup Strand (55°49'51.02"N 11°23'18.21"E), 17-07-2011, disturbed sandy coastal grassland, leg. H.H. Bruun.

F: Faaborg, Sundet (55° 6'6.68"N 10°14'40.69"E), 09-07-2011, verge of tarmac road, leg. Gunnar Knudsen

F: Faaborg (55° 6'18.10"N 10°12'30.80"E), 09-07-2011, verge of tarmac road, leg. Gunnar Knudsen

F: Aarup (55°25'24.65"N 10° 1'55.00"E), 04-07-2011, vegetable garden, leg. Jens Lund Hansen.

These records suggest that the species is widespread in Denmark and locally common. It is unlikely to be an immigrant of the most recent years, but it is possible that it has colonized the country during the last century. In any case, it is surprising that a species inducing such conspicuous galls on a very common plant species has gone unnoticed until now.

The species has a Eurosiberian distribution and is widespread in Europe (Skuhrová 1986). Its galls have been found also in southern part of Central Siberia (Skuhrová & Skuhrový 1993) and in Armenia (Mirumjan, 2011). It seems that populations of this species in Central Europe have a declining tendency. On the basis of zoogeographical analysis, this species is considered as critically endangered in the Czech Republic (Skuhrová 1994 a, 1994 b, Skuhrová 2005). It also occurs in Schleswig-Holstein (Pichinot & Meyer 1998) and in Sweden (Wahlgren 1944), so – like for *Bayeriola thymicola* and *Dasineura virgaeaureae* – the new records fill a hole in the known geographical distribution. In Schleswig-Holstein, it is known to gall both *Artemisia vulgaris* and *A. campestris*, but only the former plant species has been found as host in Denmark so far.

### *Tricholaba viciarum* Stelter, 1963

Yellowish larvae were found to live in folded leaflets of *Vicia cracca* (Fabaceae) in July 2005 – see Fig. 9. Two females and one male hatched within some weeks of the collection date together with much more numerous adults of *Dasineura spadicea* (Rübsaamen, 1917). Probably *T. viciarum* lives as an inquiline in galls of the said species. The new Dan-



Fig. 9. Galls induced by *Dasineura spadicea* in folded leaflets of *Vicia cracca*, in which larvae of *Tricholaba vicarium* live asinquilines. Læsø, 1999, photo JJ.

Fig. 9. Galler af *Dasineura spadicea* i form af sammenfoldede og fortykkede småblade af muse-vikke (*Vicia cracca*), hvori larver af *Tricholaba vicarium* lever som inkviliner. Læsø, 1999, foto JJ.

ish record adds to previously founds from the vicinity of Rostock in northern Germany (the type locality) and from the Czech Republic (Skuhrová 2006).

NEJ: Læsø, Museumsgården, 2005 (57°15'47"N 11° 1'57"E), leg. J. Jørgensen, det. M. Skuhrová.

#### *Trotteria ligustri* Barnes, 1954

Gall midges were reared from swollen, unopened flower buds of *Ligustrum vulgare* (Oleaceae) collected in late June and early July 2006. Five pink larvae were retrieved and, later, one adult female emerged. Somewhat later, in Spring 2007, numerous adults of *Placochela ligustri* (Rübsaamen) hatched from the same galls. Probably, *T. ligustri* lives as an inquiline in flower bud galls induced by *P. ligustri*. It is known to occur in England, the Czech Republic, Italy and Austria (Skuhrová 1986).

NEJ: Læsø, Kokvad, 2005 (57°14'50"N 11° 0'14"E), leg. J. Jørgensen, det. M. Skuhrová.

#### *Zeuxidiplosis giardi* (Kieffer, 1896)

Red or yellow-red larvae cause leaf bud galls on *Hypericum* spp., usually *H. perforatum* L. (Hypericaceae). The leaf pair at the vegetative tip or in stem axils forms a globular discoloured gall with a large chamber inside, in which one or two larvae develop and pupate. It is primarily a European species, which has been introduced to North America (USA,

Canada), Australia, New Zealand and South Africa for biological control of *Hypericum perforatum*. In Europe it has a disjunct distribution range (in contrast to the coherent range of *Dasineura hyperici*) and at present is known from 23 countries of Europe (Skuhrová 1986, Skuhrová et al. 1984, Skuhrová & Skuhrový 2009, Skuhrová et al. 2005, 2008).

NEJ: Læsø, Klitten, 2007 (57°17'8"N 11° 3'41"E), leg. J. Jørgensen, det. M. Skuhrová.

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