

The host plants of *Euura cinereae* Kopelke, 1996 and *E. auritae* Kopelke, 2000 (Hymenoptera: Tenthredinidae)

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Euura auritae and *Euura cinereae* are distinct species making spindle-shaped stem galls on *Salix aurita* and on *Salix cinerea*, respectively. Different morphological criteria and no-choice as well as multiple choice oviposition experiments have proved *E. auritae* and *E. cinereae* to be distinct species. *Euura cinereae* on *S. cinerea* is distributed at least over Southern Norway, Germany and Austria, but within its distribution area it may occur patchily. A recent paper doubted that the type specimens of *E. cinereae* had been reared from *S. cinerea*, but rather that they had been reared from *S. aurita*. However, as discussed in the present paper, they give no convincing evidence that *E. cinereae* occurs on *S. aurita* rather than on *S. cinerea* in Finland.

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1. Introduction

Euura cinereae Kopelke, 1996 and *E. auritae* Kopelke, 2000 are monophagous, univoltine sawflies, inducing spindle-shaped stem galls on their host plants *Salix cinerea* and *S. aurita*, respectively. These species belong to the *Euura atra*-group which has been revised by Kopelke (1996). All species have been reared from galls collected from various localities and supplementary host preferences of ovipositing females were studied (Kopelke 1996, 1999, 2000).

E. cinereae was described from specimens reared by Heikki Roininen; their host plant was previously identified as *Salix cinerea* (Roininen *et al.* 1993). Simultaneously, also *E. cinereae* has been reared by the author from stem galls collected from *S. cinerea* in the Hordaland province,

Norway, and in Schleswig-Holstein, Germany (Kopelke 1999). In addition, stem galls of *Euura* from *S. cinerea* have been reared by Ewald Altenhofer in Lower Austria. These willow specimens were checked by the author during a field trip in the summer of 1998 and were confirmed to be *S. cinerea*. They were again infested with stem-galls of *E. cinereae*.

According to Roininen *et al.* (2001), there should be new evidence for a misidentification of the food plant of the Finnish population of *E. cinereae*. They believe that it needs further examination “whether *Euura cinereae* or any other species from the *Euura atra*-group is capable of forming galls on *Salix cinerea*”. However, the morphological and biological characters (like host plant preferences) of the original and of supplementary material reared have not been taken into

their consideration. These characteristics are decisive to separate *E. cinereae* from *E. auritae* and from their relatives in the *atra*-group (Kopelke 1996, 1999, 2000).

2. Taxonomy and host plants

2.1. Types, *locus typicus*

E. cinereae was described from specimens reared by Heikki Roininen. The author has received the original material together with reared specimens from *S. starkeana*. The material was labeled with the following specifications “*E. atra*, *S. cinerea*: Joensuu 89”; individuals of the additional material with “*E. atra*, *S. starkeana*: Joensuu 89”. According to this label specifications, there are no clear references to “Joensuu University campus” which Roininen *et al.* (2001) considered to be the *locus typicus* of *E. cinereae*.

The Joensuu University campus was repeatedly examined by Roininen *et al.* (2001) in 1999/2000. The authors stated that *S. cinerea* was not found at the supposed “type locality”, but they admit that “some bushes of it grow near the edge of the wood”. Moreover, they constituted that the “particular tall specimens or similar individuals of *S. aurita* were used in multiple-choice tests by Roininen *et al.* (1993)”. The oviposition experiments that the authors referred to have been conducted with sawflies collected from *Salix fragilis*, *S. alba* and *S. cinerea* in Joensuu (Roininen *et al.* 1993). However, *S. fragilis* and *S. alba* do likewise not grow at the study site on the University campus of Joensuu, as mentioned in Roininen *et al.* (2001).

Roininen with his colleagues had made additional studies on *Euura* from *S. cinerea* and other willows, specifying several different sites within and near the town of Joensuu (Price *et al.* 1987a, b, 1994, Roininen 1991, Roininen *et al.* 1993, 1994). According to the specifications on the labels, it cannot be excluded that the original material might perhaps have been reared from host plants of one of these sites.

Besides, individuals of the additional material from *S. starkeana*, I have received together with the original material of *E. cinereae*, are labelled with the same specification “Joensuu 89”. However, according to Roininen *et al.* (2001), *S. starkeana* (like

S. fragilis and *S. alba*, see above) does not grow at the site of the University campus of Joensuu.

Thus, Roininen *et al.* (2001) presented no convincing evidence that the original material of *E. cinereae* has been reared from the particular willow specimens of Joensuu University campus.

2.2. *S. aurita*, *S. cinerea* and hybridisation

Salix aurita, *S. cinerea*, and *S. caprea* are closely related species belonging to the *Salix* section *Vetrix*. *S. aurita* is usually growing as rounded bushes of medium size (1–3 m) (Hegi 1957, Rechinger 1964, Neumann 1981, Hörandl 1992, Newsholme 1992, Lautenschlager-Fleury 1994, Skortsov 1999, Berg & Christensen 2000). However, Berg and Christensen (2000) gave the only hint in literature about the unusual size of *S. aurita* ascending to an erect shrub, up to 3 (–7) m. Taller specimens may be the exception, but they give rise to some doubt. The taxonomy of the related *S. aurita*, *S. caprea*, and *S. cinerea* is particularly complicated by the fact that hybridisation is common within the group. Hybrids of *Salix cinerea* are known with several species and are frequent to some extent with *aurita* (Meikle 1992, Berg & Christensen 2000). Hybrids might not be readily recognized in the field or herbarium. “If major distinguishing characters are under the control of one or two dominant genes, hybridization may go unrecognized, ... hybrids may be imperfectly intermediate or highly variable, resulting in an interpretation that unrecognized hybrid plants are merely part of the morphological variation in one of the species” (Hardig *et al.* 2000). Therefore, the identification of the willow specimens at the University campus of Joensuu needs further confirmation with regard to hybridization. There is no doubt that galls of *Euura*, *Phyllocolpa*, and *Pontania* may frequently be induced on hybrids of their own host plant (Kopelke 1999).

2.3. Distribution ranges

The gall making species of *Euura*, *Phyllocolpa*, and *Pontania* are patchily distributed within the distribution range of their own specific host plant (e.g. Craig *et al.* 1988, Kopelke 1999). Their abun-

dances vary in time and space over local and regional scales due to the numerous biotic and abiotic factors involved. Even though the hostplant species is present at a site, there is often no indication about its specific gall makers. Collecting trips have been undertaken by the author throughout Europe during the past 20 years, but rare species of gall-making sawflies have been found only by chance. Roininen *et al.* (2001) emphasized that “Veli Vikberg and Alexey Zinovjev have never found spindle-shaped stem galls of *Euura* species on *S. cinerea*”. Such an argument may be considered as a convincing indication for the absence of a certain species, but it is not certainly evidence for the absence of *E. cinerea* in Finland.

Salix cinerea is distributed over large parts of Central Europe; in Northern Europe it is common in Finland, Sweden, and in the southern provinces of Norway. Stem galls from *S. cinerea* have been collected in Skutevik, at the Hardanger Fjorden (Hordaland, Southern Norway) (Kopelke 1999). Roininen *et al.* (2001) remarked that “*S. cinerea* does not range to Hordaland”. However, Jalas and Suominen (1976), Svortsov (1999) and Berg & Christensen (2000) reported *S. cinerea* from the adjacent southern and eastern provinces. According to Knud Christensen (pers. comm.), there is no reason why *S. cinerea* should not grow in Hordaland. Berg & Christensen (2000) have defined the distribution range only by checking herbarium specimens and by rather incomplete information obtained from Norwegian colleagues (K. Christensen, pers. comm.). In accordance with the published distribution range, Roininen *et al.* (2001) doubted the presence of *S. cinerea* in Hordaland and speculated that it “might have been *S. aurita*, or some hybrid, such as *S. aurita* x *lapponum*”. However, the collecting site along a lake near Skutevik in Hordaland was exclusively colonized by *S. caprea* and *S. aurita*, as well as by a few specimens of *S. myrsinifolia* and *S. cinerea*, respectively, most of which might have been planted. No specimen of *S. lapponum* was growing within a larger radius of the area. Besides, the specimens of *S. aurita* were strongly attacked by the bud galler *E. mucronata*, but no stem galls were present, and, vice versa, the neighbouring *S. cinerea* specimens were infested only with stem galls but not with bud galls.

2.4. Morphology and oviposition experiments

E. auritae and *E. cinerea* were described by the author on the base of reared material. Several morphological characters are apparent to separate these species from each other and from related species of the *atra*-group (Kopelke 1996, 1999, 2000). The morphological characters of the supplementary material of *E. cinerea* reared, the stem galls of which have been collected on different sites (Kopelke 1999), were checked and compared with those of the original material. Furthermore, oviposition preferences of the species of the *Euura atra*-group were studied both by the multiple choice and by no-choice experiments in the laboratory. The test plants (12 *Salix* species, 128 specimens) for the oviposition experiments were collected at 44 localities in 6 countries (Austria, Denmark, Germany, Italy, Norway, and Switzerland) and were cultivated in the “willow garden” of our institute (Kopelke 1999). At least 36 *Euura* sp. (*atra*-group) by *Salix* sp. combinations were tested in more than 100 experiments using 190 females (7 spp.) from 38 populations of different European regions (Kopelke 1999). Among the total number of 128 willow samples (referring to the *E. atra*-group), 16 specimens of *S. aurita* and of *S. cinerea*, respectively, were used in the experiments. Like their relatives, *E. auritae* and *E. cinerea* strongly preferred their original host plant species, without any exception. Females from *S. aurita* rejected completely *S. cinerea* or any other host plant species tested, and, vice versa, females from *S. cinerea* refused to accept *S. aurita*, as well as any other test species. No indications of geographical variation in host plant preferences have been observed in *Euura* or in *Pontania*, 38 species of which were tested in more than 190 *Pontania* sp. by *Salix* sp. combinations, using more than 500 females from more than 150 populations of different European regions (Kopelke 1990, 1996, 1999, 2000).

3. Discussion

Roininen *et al.* (2001) considered *S. aurita* to be the correct host plant of *E. cinerea*. However,

this assumption is based on questionable specifications of the *locus typicus* and of host-plant specimens from which the original material of *E. cinereae* has been reared. The original labels of Roininen give no specifications which point to Joensuu University campus as being the *locus typicus*. Besides, there is no convincing evidence that the original material of *E. cinereae* has been reared precisely from the particular tall specimens of "*S. aurita*" which were used in multiple-choice tests by Roininen *et al.* (1993). Roininen *et al.* had specified in their studies several different sites within and near the town of Joensuu (Price *et al.* 1987a, b, 1994, Roininen 1991, Roininen *et al.* 1993, 1994). The author has received a few *Euura* specimens from *S. starkeana*, together with the original material, all of which were labeled with the same specification "Joensuu 89". However, *S. starkeana* is not growing at the supposed *locus typicus*, University campus of Joensuu (Roininen *et al.* 2001). Therefore, the original material might have come from any other locality within the town of Joensuu.

A correct discrimination between the related *S. aurita*, *S. caprea*, and *S. cinerea* is particularly complicated due to their hybridisation. Hybrids of *Salix cinerea* with *S. aurita* are to some extent quite frequent (Meikle 1992, Berg & Christensen 2000). Sometimes, hybrids might not have been readily diagnosed in the field or in the herbarium (Hardig *et al.* 2000), but Roininen *et al.* (2001) did not consider this possibility, especially with the atypically tall specimens of their "*S. aurita*". According to the literature, *S. aurita* is usually growing as a medium-sized bush of rounded shape (Hegi 1957, Rechinger 1964, Neumann 1981, Hörandl 1992, Newsholme 1992, Lautenschlager-Fleury 1994, Skortsov 1999, Berg & Christensen 2000).

There is no doubt that *E. cinereae* on *S. cinerea* is spread at least over Southern Norway, Germany and Austria, but within its distribution area it may occur patchily, and perhaps sometimes in low density. The type specimens of *E. cinereae* were collected in Finland, the morphological characters of which correspond conspicuously with those of the material reared from *S. cinerea* at different sizes, indicating that *E. cinereae* may occur on *S. cinerea* in Finland, too. Roininen *et*

al. (2001) doubt that the type specimens of *E. cinereae* have been reared from *S. cinerea*, but they give no convincing evidence that *E. cinereae* does not occur on *S. cinerea* in Finland or that *E. cinereae* does occur on *S. aurita*. Often information about distribution ranges of animals or plants are incomplete and vague. This applies to *S. cinerea*, which is recorded in Norway from different southern and eastern provinces but not from the adjacent Hordaland (Jalas & Suominen 1976, Skvortsov 1999, Berg & Christensen 2000). However, Knud Christensen (pers. comm.) has no doubt that *S. cinerea* may be found in Hordaland as well.

Several morphological characters are apparent to separate the original material of *E. cinereae* (together with supplementary specimens from *S. cinerea* reared by the author) from related species of the *atra*-group (Kopelke 1996, 1999, 2000). Oviposition preferences of the species of the *Euura atra*-group were studied both by the multiple choice and the no-choice experiments in the laboratory. All species of the *atra*-group strongly preferred their original host plant species (Kopelke 1996, 1999, 2000). However, these published results of the morphological and biological studies were not taken into consideration by Roininen *et al.* (2001). Thus, on the basis of the findings of Kopelke (1996, 1999, 2000), there are convincing indications that *E. auritae* and *E. cinereae* are distinct species developing on *S. aurita* and *S. cinerea*, respectively. The presence of *E. cinereae* on *S. cinerea* have been demonstrated in regard to different populations from Germany, Norway, and Austria. According to the verified host plant specificity of the tested species and the conformity of the morphological characters (of type specimens and material reared from *S. cinerea*) there are some convincing indications that *E. cinereae* may occur on *S. cinerea* in Finland. However, there is currently no certain evidence for the real host plant species in this country.

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