NOBANIS - Invasive Alien Species Fact Sheet

Cameraria ohridella

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Species description

Scientific names: *Cameraria ohridella* Deschka & Dimić, 1986. Gracillariidae
Synonyms: no synonyms are known.
Common names: horse-chestnut leafminer (GB), Rosskastanien-Miniermotte, Biergarten-Motte (DE), Kastanie-minérmøl (DK), Szrotówek kasztanowcowiaczek (PL), Minerarmal på hästkastanj (SE).

Fig. 1. Horse-chestnut leaf with mines of the horse-chestnut leafminer larvae (*Cameraria ohridella*), photo by Jarosław Buszko.

Fig. 2. The opened leafmine showing the horse-chestnut leafminer larva, photo by Jarosław Buszko.

Fig. 3. The *Cameraria ohridella* moth, photo by Jarosław Buszko.

Fig. 4. *Cameraria ohridella* moths resting on bark, photo by Jarosław Buszko.

Species identification

The species represents a family of small moths including about 1800 species in the world fauna. In Europe about 235 species are known, and Poland is inhabited by 115 species. The above mentioned moth is the only representative of the genus *Cameraria* Chapm. in Europe. This genus is distinguished from closely related *Phyllonorycter* Hbn. by the morphological features of larvae, which have reduced thoracic and abdominal legs. However, adults of *Cameraria ohridella* might be confused with a number of European *Phyllonorycter* species. The moth is 6-7 mm long, with wingspan confined within the range of 7.0-9.5 mm. Head with reddish hair. The antenna is almost as long as the forewing. The ground colour of thorax and forewing is reddish-brown. The forewing has a short white basal streak, two outwardly curved white narrow fasciae edged with black and two pairs of narrow costal and dorsal streaks. The apical part of the forewing is covered with rough blackish scales. The hind wings and abdomen are grey, while legs are whitish with dark spots.

Native range

The area of origin of *Cameraria ohridella* is obscure. The species was discovered in Macedonia (formerly Yugoslavia), where natural stands of *Aesculus hippocastanum* are present, but the

speed of invasion indicates that the species was rather a newcomer to that area. The genus *Cameraria* is most abundant in North America, where about 50 species are known. One of them (*Cameraria aesculisella*) also feeds on *Aesculus*, but it has a completely different life strategy. Another possible area of origin is East Asia, namely China. Unfortunately, the Gracillariidae from that part of the world are very poorly investigated.

Alien distribution

History of introduction and geographical spread

The species was for the first time noticed in early 1980s in the vicinity of Ohrid Lake in Macedonia, and in 1986 was described as a new species (Deschka & Dimić 1986). Since that time its gradual spread northwards was noted and the species reached Croatia, Hungary and Romania within a few years. After its discovery near Linz in Austria 1989 (Šefrova & Laštuvka 2001), the invasion rapidly spread and up to 1994 the Czech Republik and Germany were colonized. In Poland the species was discovered in 1998 for the first time in Lower Silesia (Łabanowski & Soika 1998), and within five years its range extended over the entire country (Fig. 5). In some places traces of the species were found out of its continuous range which can be explained by artificial introductions (*e.g.* Gdańsk and vicinity), most often by transport of the adults inside cars, trucks or trains. The rate of expansion in Poland was about 100 km a year. Some areas in NE Poland were rather slowly colonised in comparison to the western provinces. In 2002 the species was found in southern Sweden, Denmark and Britain (Buhl *et al.* 2003, Karsholt and Kristensen 2003). In 2006 the species was also found on the southern tip of Finland at Hanko where ferries from Germany arrive, therefore it is speculated that the species has been transported to Finland from Germany (Harry Helmisaari, pers.comm.).

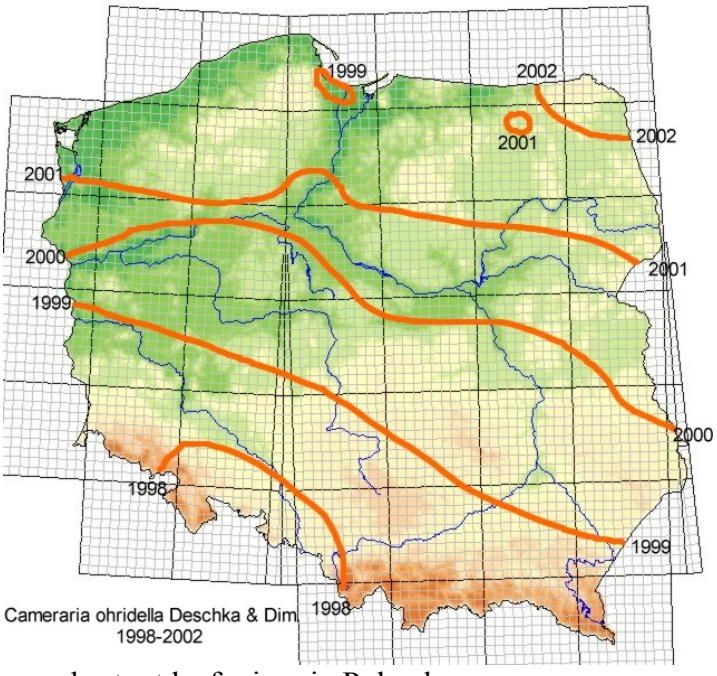

Fig. 5. Invasion of horse-chestnut leaf miner in Poland.

Pathways of introduction
The species spreads from its original point of entry by way of a rapid uniform expansion along a broad front. However, in some cases introduction by means of transport is possible and thus isolated stands outside of the continuous range are established. This might be the case for the new arrival in Finland, as mentioned above.

Alien status in region
The species has potential to quickly colonise the countries where it has arrived. In Poland it took only 5 years to colonize the entire country (Fig. 5) and it is now present almost everywhere, with exception of higher elevations (in Zakopane at the foot of Tatra Mts., about 900 m a.s.l., the species was absent, while in lower places at the same time it was seen very abundant) (Buszko 2003). In Denmark, which is a much smaller country, the colonisation process took only 2 years (Ravn *et al.* 2004b).
Presently the species is known from Germany, Poland, Denmark, as well as the southern parts of Sweden and Finland (Heitland and Freise 2001, O. Karsholt, pers.comm.) See also table 1. *Cameraria ohridella* is not yet present in Estonia and there have been no records regarding the damages to trees (Kaljo Voolma, pers.comm.). From current evidence it can, however, be predicted that invasion will continue until the range of the moth covers the range of the horse chestnut in Europe.

Country	Not found	Not established	Rare	local	Common	Very common	Not known
Denmark						X	
Estonia	X						
European part of Russia	X						
Finland			X				
Faroe Islands	X						
Germany						X	
Greenland	X						
Iceland	X						
Latvia	X						
Lithuania		X					
Norway	X						
Poland						X	
Sweden			X				

Table 1. The frequency and establishment of *Cameraria ohridella*, please refer also to the information provided for this species at www.nobanis.org/search.asp. Legend for this table: **Not found** - The species is not found in the country; **Not established** - The species has not formed self-reproducing populations (but is found as a casual or incidental species); **Rare** - Few sites where it is found in the country; **Local** - Locally abundant, many individuals in some areas of the country; **Common** - Many sites in the country; **Very common** - Many sites and many individuals; **Not known** - No information was available.

Ecology

Habitat description
The species is trophically related to horse chestnut (*Aesculus hippocastanum*), which is an introduced tree species in Central and Northern Europe. It is commonly planted in parks, roadsides and urban green. In forests horse chestnut is rare and has no importance to natural and semi natural habitats. However, it might be important for wild life in regions where natural habitats have been destroyed.

Reproduction and life cycle
Cameraria ohridella produces from one to four generations a year. The female may lay up to 80 eggs during its life. Eggs are placed separately on the upper surface of the leaf. The young larvae penetrate the leaf, and make a large yellowish to reddish blotch (the mine) on the upper side of the leaf. The number of moults is usually four. The last stage of the larva makes a round and flat cocoon where pupation takes place. Hibernation occurs in the pupal stage. The pupa is resistant to low temperatures. The density of mines may be very high, sometimes exceeding 100 per leaf. Generally horse-chestnut (*Aesculus hippocastanum*) is attacked, less frequently *Aesculus x carnea* and exceptionally rare Norway maple (*Acer platanoides*) and sycamore (*Acer pseudoplatanus*). The parasitoids reared from preimaginal stages of *Cameraria ohridella* represent rather polyphagous forms associated with other species of mining Lepidoptera. In Poland the most abundant were chalcids of the genus *Minotetrastichus*, with share up to 75% of all parasitoids reared. Parasitisation ratio is low, and usually does not exceed 10%. To other animals *Cameraria ohridella* is not competitive, because the horse chestnut is utilised by very few herbivorous species in Central Europe, since it itself is an alien species. However, *Cameraria ohridella* may affect the abundance of local, unspecific parasitoids.

Dispersal and spread
The basic mean of spread is natural anemochore dispersal. The small moths are easily drifted by the wind in great numbers and with high density of planted horse-chestnut trees the efficiency of colonisation is high. In some cases humans are also involved in spreading, as introduction in new sites by means of transport is possible (isolated stands outside of continuous range), which may be effective both in adults and hibernating larvae in leafmines. Human transportation is believed to be the general mean of long distance dispersal since new records are always found along routes of transportation (Gilbert *et al.* 2004). Both adult moth and hibernating larvae in leafmines could be subject to this passive transport.

Impact

Affected habitats and indigenous organisms
Cameraria ohridella is an herbivorous organism and its impact is seen on particular trees and stands of trees in urban green. A high number of mines make the leaves wilt. In July and August leaves on trees are frequently heavily damaged and in September trees try to develop leaves and flower again. Despite the mentioned damages horse-chestnut trees are not mortally endangered, as the impact of the pest is seen in the second half of the summer and in autumn. However, it might put an additional stress on horse chestnut trees that are already affected *e.g.* by the salt used in the streets during winter. It is mostly the aesthetic aspects that are important, because ugly

looking trees make a sad impression on town inhabitants. No ecological or abiotic processes are influenced.

Genetic effects
There is no genetic effect on other organisms.

Human health effects
There is no danger of toxic or disease effects on humans or other organisms.

Economic and societal effects (positive/negative)
Economic effects are connected to the necessity of pest management with the use of insecticides, pheromones and sticky tapes. Social effects are based on human acceptance for the horse chestnut. This tree is very popular in the urban environment; in Germany *e.g.* it is a typical tree outside restaurants and bars ("beer gardens"). Generally the horse chestnut is frequently planted around human settlements. Its flowering is associated with the exams completing secondary education. There are major public concerns about the condition of horse chestnut and focus on how authorities act to remove the threat by *Cameraria ohridella*.

Management approaches

Prevention methods
No prevention has shown possible, as the species is dispersed practically everywhere by wind and human transport.

Eradication, control and monitoring efforts
There are few methods applied to reduce a negative effect to the horse chestnut trees in Europe. In the autumn leaves are removed from beneath the trees and subsequently composted at high temperatures or burnt. An essential aspect of this method is to remove all leaves before April 1st, before the moths emerge from the puppae (Kehrli and Bacher 2004, Ravn *et al.* 2004a,b). School children and other citizens may be involved in this activity. A second method is the injection of the insecticide (imidaclopride) inside the tree trunk. This method seems to be effective and relatively cheap (*e.g.* references in Anonymous 2004). The effects of insecticide furthermore extend over several years. A third method – the application of sticky tapes can not be recommended since a large set of non-target insects and spiders (among them beneficial species) are affected.
The newest method (not yet available on the market) is to store the old leaves under the trees in boxes with gaze (a fine net). The natural enemies/predators (*Chalcidoidea*-species) who also over winter in the old leaves (and who are also removed and killed by the "old" method) are smaller than *Cameraria* and can escape and kill *Camerarira*, while *Cameraria* stays inside and dies (Kehrli *et al.* 2005). Other biocontrol methods might appear in the future (Grabenweger *et al.* 2005, Kenis *et al.*, in press)

Monitoring programs are performed in several places in Europe using pheromone traps. It is suggested to follow the advice provided by the scientific group working on the species - Controcam (Cameraria-homepage).

Information and awareness
Wide information campaigns are conducted by Polish nature conservation organisations and schools participate in autumn by collecting fallen leaves. Several symposia on pest management were organised in Poland, involving the local authorities. In Poland and Denmark the problem of *Cameraria ohridella* has frequently been presented in general media, although often treated as "seasonal news".

Knowledge and research
Research on the biology of *Cameraria ohridella* is carried out in several institutes in Poland. The main data concern the impact of abiotic factors, parasitisation ratio and resistance of trees to the pest. Some research aimed at methods which use nematodes to control *Cameraria ohridella* are carried out in Poland. The results are expected soon.

Recommendations or comments from experts and local communities
None.

References and other resources

Contact persons
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Links
Cameraria homepage - Controcam

Horse chestnut leafminer (*Cameraria ohridella*) (in Britain)

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