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# On the host plants of several leaf beetles of Central Europe – the problem of fame and evidence
## (Coleoptera: Chrysomelidae)

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### Abstract

The host plants of chrysomelids are mentioned in many identification keys and faunal lists, but their records are often incomplete or incorrect. To find out the definite host plant of a definite species in a definite area, feeding choice experiments have been carried out with 14 Chrysomelidae species from a prospective nature reserve in Upper Austria. The results were then compared with the records in the main literature. The corresponding and contradictory conclusions are discussed. Combining the results of the feeding choice experiments with the records of several books, it is possible to narrow down possible host plants of the investigated chrysomelids in most cases.

It is proved that *Prasocuris marginella* does not feed on *Caltha palustris* in the investigated area. *Neogalerucella tenella* feeds on *Polgynum bistorta*, but on no other *Polygonum* species displayed in the experiment. *Cassida leucanthemi*, which was described only recently on *Leucanthemum vulgare*, feeds on the closely related *Leucanthemum ircutianum*, too, but not on other displayed Asteraceae.

**Key words**: Coleoptera, feeding choice experiments, erroneous records, host plant relation, host plant variety.

### Introduction

More than 50,000 species have been described until now in the phytophagous beetle family Chrysomelidae (SANTIAGO-BLAY 1994). This high species diversity is mainly due to specialization on different host plants. The majority of the species – as far as is known – is oligophagous. They feed on only a few plant species, and these plant species are closely related, in most cases.

Plants try to prevent consumption by other organisms. Because they cannot run away or bite back in defence, one strategy against phytophagous intentions is to produce secondary plant compounds as a form of chemical defence. But the chrysomelids have managed to evolve metabolic processes to deal with these more or less toxic compounds. Many species use these defensive plant compounds to synthesize chemical defence compounds to their own advantage. This fact reveals a long co-evolution of the chrysomelids and their host plants. Over the past two decades, a lot of investigations on this topic have been carried out, especially by PASTEELS et al. (1994), but only with a small number of the species found in Central Europe.

Many chrysomelid species are difficult to identify. Therefore, it is also useful, if the identifying key mentions the host plant(s) (MOHR 1966, KIPPENBERG 1994, 1998, DÖBERL 1994, 1998). Due to the studies of STEINHAUSEN (1994), who reared a lot of chrysomelid larvae to compile his identification key, our knowledge of the host plants of the chrysomelids of Central Europe has increased over the past two decades. In many faunal lists, where chrysomelids are recorded, host plants are also mentioned.

But if somebody tries to find out the particular host plant species of a particular chrysomelid species, it soon proves to be very difficult and unreliable. The compilation of records from the literature often leads to the following results:

a) The host plant species mentioned in different books and papers differ suspiciously.

b) In many cases only the plant genus is mentioned.

There are many reasons for these puzzling results, which are discussed in detail in GEISER (2004). Furthermore, it has to be borne in mind that the beetle populations may feed on different host plants in different regions of the distribution area of the species.

For the answer to such a presumably simple question, what are the host plants of a particular chrysomelid species, feeding choice experiments and reliable field observations in different parts of the distribution area are necessary. The definite answer needs further experiments focussing on rearing over several generations.

For her diploma dissertation FUSS (2002) investigated the chrysomelid inventory and the ecological parameters of the chrysomelids and vascular plants of a prospective nature reserve. The aim of this diploma study was to improve the management plan of this area, which so far had only been based on the requirements of breeding birds. Therefore, the biology of the collected chrysomelids, including their host plants also had to be described. Due to the uncertainties mentioned above, feeding choice experiments were carried out with a part of the species. The host plants, on which the species were feeding before they were collected, were tested, as were some other plant species in the vicinity of the sampling site. For the species caught with a landing net, the host plants were assumed according to MOHR (1966) and STEINHAUSEN (1994), and tested in a similar way.

The results of the diploma dissertation concerning nature conservation were published in FUSS & PATZNER (2005). Although the feeding choice experiments were carried out for conservation purposes, they led to some interesting results concerning the questions mentioned above. Elisabeth Geiser checked these results with the food plant information in literature for these species and contributed comments on the corresponding and/or contradictory records.

**Nomenclatory remark**: The names of the Chrysomelidae follow MOHR (1966), KIPPENBERG (1994, 1998) and DÖBERL (1994, 1998). Former names according to LUCHT (1987) are printed in brackets. Plant names follow ADLER et al. (1994).

## Location, material and methods

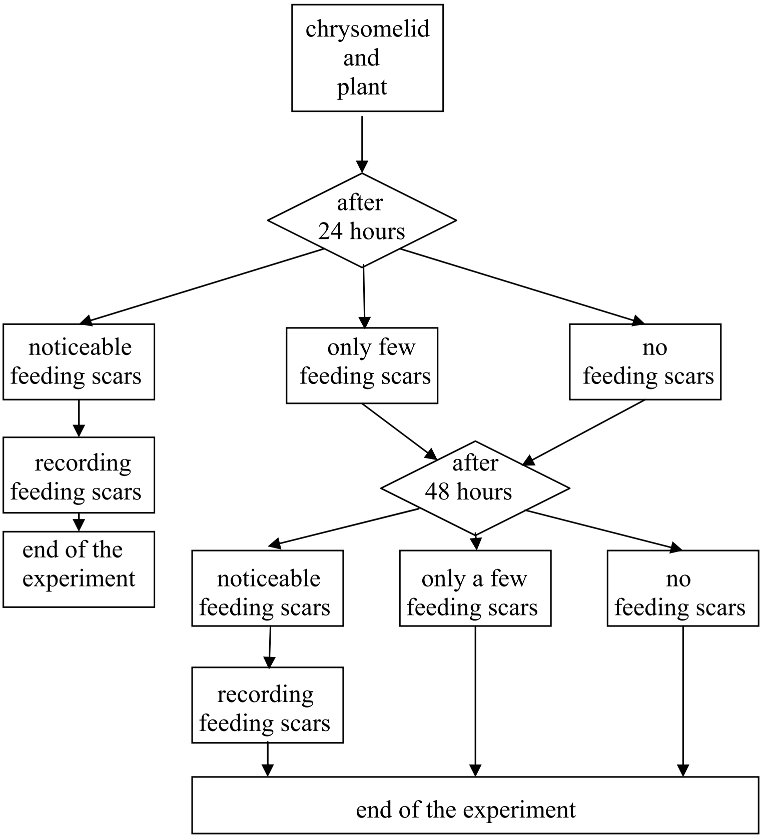
The chrysomelid species and their presumptive host plants were sampled from four meadows and two fallow pastures in the Koaserin area (48°21'N, 13°47'E) near Peuerbach, about 40 km northwest of Linz, Upper Austria. From April to September 2000 the species inventory was investigated in these areas. The sampling methods were visual search of the vegetation for the chrysomelids and catching with a landing net.

Feeding choice experiments were carried out with adults of 14 species. The beetles were put into jars with screw caps. These jars have a capacity of ¼, ½ and 1 litre. The jars were opened once a day to put fresh leaves for the chrysomelids into them. Therefore, the beetles had enough oxygen in the jars.

Some leaves were added simultaneously from each plant species on which the beetle species had been found to each jar containing 5–10 adult chrysomelids. Then only one plant species was offered to the beetles inside the jar. If after 24 hours no or only a few feeding scars were detected, the beetles and the leaves stayed in the glass for another 24 hours. When feeding scars were detected, they were recorded and the experiment was stopped. After 48 hours checks were carried out, whether there were feeding scars on the leaves or not. The experiment was stopped after this period of time. If the result was negative, it was assumed that the tested plant species was not a host plant and the chrysomelid had been sitting on it only by chance.

The experiments were carried out in a period, where the tested chrysomelid species laid eggs or larvae were present. Therefore it can be precluded that the accepted plants are only a "second choice" before the real host plant occurs (for details, see *Chrysolina fastuosa*).

The set-up of the feeding choice experiment is shown below:



## Results

The results of the host plant choice experiment were very clear (except for *Sermylassa halensis*, see there). Either there were a lot of feedings scars from the first day of the experiment or no feedings scars could be found on the displayed leaves during 48 hours.

### *Oulema gallaeciana* (HEYDEN, 1870)

[*Lema lichenis* (VOET, 1806)]

Subfamily: Criocerinae.

Distribution area: Palearctic, introduced in the Nearctic.

Result of the feeding choice experiment:

Feeding scars on: *Lolium perenne*, *Holcus lanatus.*

No feeding scars on: *Phalaris arundinacea*, *Echinochloa crus-galli*, *Carex.*

**Host plants recorded**: Poaceae, cereal pest (MOHR 1966, STEINHAUSEN 1994). Poaceae, on grain, too (KOCH 1992, FRANZ 1974). *Agropyron repens*, *Bromus erectus*, *Hordeum vulgare* (BURAKOWSKI et al. 1990). On several Poaceae: *Dactylis*, *Festuca*, *Bromus*, also on cereals: *Avena sativa*, *Hordeum*, *Secale cereale*, *Triticum*, and *Zea mays* (SCHMITT 1988). Cereal pest in eastern Austria, adults also on maize (P. Cate, in litt.).

### *Oulema melanopus* (L., 1758)

[*Lema melanopa* (L., 1758)]

Subfamily: Criocerinae.

Distribution area: Palearctic, introduced in the Nearctic.

Result of the feeding choice experiment:

Feeding scars on: *Lolium perenne*, *Holcus lanatus.*

No feeding scars on: *Phalaris arundinacea*, *Echinochloa crus-galli*, *Taraxacum officinale.*

**Host plants recorded**: Poaceae, cereal pest (MOHR 1966, STEINHAUSEN 1994). Poaceae, on grain, too (KOCH 1992). Reported from a variety of Poaceae: *Avena*, *Dactylis*, *Hordeum*, *Lolium*, *Phleum*, *Secale*, *Triticum*, and *Zea*. It prefers *Triticum* to wild grasses like *Poa annua* or *Holcus lanatus*. (SCHMITT 1988). Cereal pest in eastern Austria, adults also on maize (P. Cate, in litt.).

**Comments** (on both *Oulema* species): The defence strategy of Poaceae against herbivores is to store silicate acid in the epidermis. This is a repellent for many herbivores, but not effective against some species of Artiodactyla, Perissodactyla and other animals like the two beetle species mentioned. If a species manages to feed on such plants, it is able to feed on many Poaceae species.

For *Oulema melanopus*, there is some evidence that they prefer $C_3$ (Calvin cycle pathway) species and avoid $C_4$ (Dicarboxylic acid pathway) species. Maize, a $C_4$ plant, is unsuitabe for the larvae and only rarely eaten by adults (WELLSO & HOXIE 1988).

In Central Europe, adult *Oulema* feeding on cereals are not a real problem, although the larvae can affect the harvest amount. However, their abundance rarely rises to such a level that pesticides can be used to an economic advantage. In contrast, in Southern Europe and in the USA, where they were introduced, *Oulema* is an important cereal pest (J. Gross, in litt).

### *Chrysolina fastuosa* (SCOPOLI, 1763)

[*Dlochrysa fastuosa* (SCOPOLI, 1763)]

Subfamily: Chrysomelinae.

Distribution area: Western Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Galeopsis speciosa.*

No feeding scars on: *Stachys sylvatica*, *Scutellaria galericulata*, *Lycopus europaeus*, *Urtica dioica*[1].

**Host plants recorded**: *Galeopsis*, *Lamium* (MOHR 1966, KIPPENBERG 1994). *Galeopsis*, mainly on *G. tetrahit* and *G. ladanum*, also on *Lamium* (KOCH 1992). *Galeopsis*, *Lamium*, *Urtica* (KASZAB 1962). *Hypericum*, *Mentha*, *Urtica* (HANDSCHIN 1963). *Galeopsis ladanum*, *G. tetrahit*, *Lamium*, other Labiatae, *Urtica dioica* (BURAKOWSKI et al. 1990). On *Galeopsis tetrahit*, observed in many places in all other parts of Austria, but near Graz on *Lamium album* only (KÜHNELT 1960).

In early spring, the adults feed on *Lamium album*, but later they change to *Galeopsis tetrahit* when it appears. They deposit their eggs there and the larvae develop. Experiments with *Urtica dioica*, *Lamium purpureum* and *Lamiastrum galeobdolon* showed that adults and larvae never feed on these plant species (TISCHLER 1979). These observations and experiments were made in Schleswig-Holstein.

**Comments**: This variety of recorded “host plants” reflects the typical plant assemblage, where these chrysomelids are sitting when collected. KÜHNELT (1960), unfortunately, did not record the date of his observations. It can be assumed that he found *Chrysolina fastuosa* feeding on *Lamium album* only in April or early May, before *Galeopsis* appeared. The record, that *Mentha* and *Hypericum* are host plants (HANDSCHIN 1963) may derive from wrong identification of the chrysomelids on these plants.

Only *Galeopsis tetrahit* and *G. speciosa* are proved to be host plants for adults and larvae, *G. ladanum* is also reliable. Adults feeding on *Lamium album* in early spring explain the various records of *Lamium* or even Labiatae as “host plants”. Then the question arises, whether other species of *Galeopsis*, e.g. *G. angustifolia*, *G. pubescens* or *G. bifida*, are used as host plants, too, but that remains to be proved.

### *Gastrophysa viridula* (DEGEER, 1775)

[*Gastroidea viridula* (DEGEER, 1775)]

Subfamily: Chrysomelinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Rumex obtusifolius*, *Polygonum bistorta.*

No feeding scars on: *Polygonum hydropiper*, *Polygonum lapathifolium*, *Ranunculus*, *Succisa pratensis*, *Plantago lanceolata*, *Crepis biennis*, *Cirsium oleraceum*, *Taraxacum officinale.*

**Host plants recorded**: *Rumex* and *Polygonum* (MOHR 1966, KASZAB 1962). Larvae reared on *Rumex obtusifolius* (STEINHAUSEN 1994). Normally on *Rumex*, rarely on *Polygonum* and on *Rheum rhabarbarum* (KOCH 1992). *Rumex*, in the alpine meadows on *Rumex alpinus* (FRANZ 1974). *Rumex obtusifolius*, *R. crispus*, *R. alpinus* (BURAKOWSKI et al. 1990). On *Rumex*, but also on *Rheum palmatum* (Chinese rhubarb, only cultivated in Central Europe). Rearing larvae for a whole lifecycle was not successful on *Rheum rhabarbarum*, *Vicia faba*, *V. sativa*, *Fagopyrum esculentum*, *Beta vulgaris*, *Brassica oleracea*, and *Vitis vinifera* (STAGL 1978).

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[1] The beetles and plants for the feeding choice experiments with *Urtica dioica* were collected in Salzburg-City.

**Comments**: Although not every *Rumex* species has been tested within the distribution area of *Gastrophysa viridula*, the record “feeds on *Rumex*” is a reliable conclusion. In the feeding choice experiment, *G. viridula* also fed on *Polygonum bistorta*, but not on the other displayed *Polygonum* species. It has not been proved yet, if this or another *Polygonum* species is a suitable host plant for the whole lifecycle. STAGL (1978) reared 12 generations on *Rheum palmatum*. Therefore, it seems possible that adults sometimes feed on *Rheum rhabarbarum*, but the result of the experiment to rear larvae on that species was negative.

### *Phaedon armoraciae* (L., 1758)

Subfamily: Chrysomelinae.

Distribution area: Palearctic.

No feeding choice experiments, but multiple observations feeding on *Veronica beccabunga.*

**Host plants recorded**: *Veronica beccabunga* and *Armoracia rusticana* (STEINHAUSEN 1994). *Veronica beccabunga* (MOHR 1966). *Nasturtium* and *Cochlearia pyrenaica* (FRANZ 1974). *Veronica beccabunga* (BURAKOWSKI et al. 1990).

The records of KOCH (1992) are contradictory: “Monophagous on *Veronica beccabunga*, after FRANZ (1974) on *Nasturtium* and *Armoracia.*”. But FRANZ (1974) mentions a plant species other than the latter (see above).

**Comments**: Due to the record “monophagous on *Veronica beccabunga*” and the evidence of feeding on this plant in the investigated area, no feeding choice experiments had been carried out. Deeper research into the literature showed, that there are also some species of Brassicaceae mentioned as host plants. But *Phaedon armoraciae* was found only on one small part of the investigated area, and no Brassicaceae were growing at this site. The literature records are contradictory: Either *Phaedon armoraciae* is monophagous on *Veronica beccabunga*, then the other host plants mentioned have been incorrectly recorded, or *P. armoraciae* cannot be monophagous. But there is also a third possibility: in some parts of the distribution area *P. armoraciae* may be monophagous and in other parts not (local monophagy). Perhaps *Phaedon veronicae* (BEDEL, 1892), which is considered to be a synonym of *P. armoraciae*, is the monophagous part of this species, or it is not a synonym but a separate species (or subspecies).

### *Prasocuris phellandrii* (L., 1758)

Subfamily: Chrysomelinae.

Distribution area: Holarctic.

Result of the feeding choice experiment:

Feeding scars on: *Caltha palustris*, *Ranunculus flammula*, *Ranunculus repens.*

No feeding scars on: *Ranunculus acris*, *Lythrum salicaria*, *Carex*, *Juncus.*

**Host plants recorded**: On various Apiaceae (MOHR 1966). Reared on *Caltha palustris* (STEINHAUSEN 1994, KIPPENBERG 1994). On aquatic Apiaceae, e.g. on *Oenanthe phellandrium*, *Cicuta virosa*, *Sium latifolium*, and on *Caltha palustris* (FRANZ 1974, KOCH 1992). *Oenanthe phellandrium*, *Cicuta virosa*, *Sium latifolium* (SPRICK 1997, KASZAB 1962). *Oenanthe phellandrium*, *Cicuta virosa*, *Levisticum officinale* (BURAKOWSKI et al. 1990).

**Comments**: *Prasocuris phellandrii* from the investigated area fed on various Ranunculaceae. Because there were no Apiaceae in the surrounding area, no specimens of this plant family were displayed in the experiment. SPRICK (1997) wrote that *P. phellandrii* feeds in some areas only on Apiaceae and in others only on Ranunculaceae. If there are really two distinct groups feeding on different plant families, it cannot be excluded that they represent two distinct taxa.

### ***Prasocuris marginella*** **(L., 1758)**

[*Hydrothassa marginella* (L., 1758)]

Subfamily: Chrysomelinae.

Distribution area: Europe (not in the southern parts).

Result of the feeding choice experiment:

Feeding scars on: *Ranunculus acris*, *Ranunculus flammula*, *Ranunculus repens.*

No feeding scars on: *Caltha palustris*, *Centaurea jacea*, *Lythrum salicaria*, *Plantago lanceolata*, *Mentha arvensis*, *Trifolium repens*, *Polygonum bistorta*, *Pimpinella major*, *Filipendula ulmaria*, *Leontodon*, *Rumex obtusifolius*, *Epilobium*, *Veronica beccabunga*, *Achillea millefolium*, *Heracleum sphondylium*, *Lycopus europaeus.*

**Host plants recorded**: On *Caltha palustris* and other Ranunculaceae (MOHR 1966, FRANZ 1974). Reared on *Ranunculus ficaria* (STEINHAUSEN 1994). *Ranunculus* and *Caltha palustris* (KASZAB 1962, BURAKOWSKI et al. 1990, KOCH 1992).

**Comments**: The most interesting result of this feeding choice experiment is that *Prasocuris marginella* does not feed on *Caltha palustris* (in Upper Austria near Peuerbach, to be exact). The records of *Caltha palustris* being a host plant may be due to: it sitting on that species or feeding on it only in early spring or in other parts of the distribution range.

### ***Plagiodera versicolora*** **(LAICHARTING, 1781)**

Subfamily: Chrysomelinae.

Distribution area: Palearctic, introduced into the Nearctic.

Result of the feeding choice experiment:

Feeding scars on: *Salix cinerea*, *Salix fragilis.*

No feeding scars on: *Alnus glutinosa*, *Prunus padus*, *Corylus avellana.*

**Host plants recorded**: *Salix*, *Populus* (MOHR 1966, FRANZ 1974, KOCH 1992). *Salix* (STEINHAUSEN 1994). Comprehensive investigations were carried out by WADE (1994) with larvae reared on five *Salix* species and on *Populus deltoides* in North America.

**Comments**: There is no doubt that *Plagiodera versicolora* feeds on various *Salix* species. The records of *Populus* being a host plant are reliable, but could not be proved due to the absence of *Populus*-trees in the investigated area.

### ***Neogalerucella tenella*** **(L., 1761)**

[*Galerucella tenella* (L., 1761)]

Subfamily: Galerucinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Filipendula ulmaria*, *Polygonum bistorta.*

No feeding scars on: *Rumex obtusifolius*, *Polygonum persicaria*, *P. lapathifolium*, *P. hydropiper*, *Lysimachia nummularia*, *L. nemorum*, *Lythrum salicaria.*

**Host plants recorded**: *Filipendula*, *Fragaria*, *Potentilla*, and *Geum* (MOHR 1966, STEINHAUSEN 1994). *Filipendula ulmaria* and other Rosaceae, like *Alchemilla*, *Fragaria*, *Potentilla*, and *Geum* (FRANZ 1974). *Comarum palustre*, *Alchemilla*, *Fragaria*, *Potentilla* and *Geum* (KASZAB 1962). *Filipendula ulmaria*, *Fragaria*, *Potentilla*, *Geum*, and *Alchemilla* (KOCH 1992).

**Comments**: *Filipendula ulmaria* was confirmed to be a host plant of *Neogalerucella tenella*. The feeding on *Polygonum bistorta* is an interesting result. But before claiming it to be a host plant of *Neogalerucella tenella*, more feeding and also rearing experiments are necessary.

### *Agelastica alni* (L., 1758)

Subfamily: Galerucinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Alnus glutinosa*, *A. incana.*

No feeding scars on: *Salix cinerea*, *S. fragilis*, *Prunus padus*, *Corylus avellana.*

**Host plants recorded**: *Alnus glutinosa* and *A. incana* (MOHR 1966, GEPP & LEHNINGER 1973). *Alnus* (STEINHAUSEN 1994). *Alnus incana* (BAUR & BENZ 1983). *Alnus glutinosa* and other *Alnus* (KASZAB 1962). *Alnus glutinosa*, *A. incana*, also on *Prunus mahaleb* (KOCH 1992). Not on *Alnus alnobetula*[2] (SCHEDL 1975)!

**Comments**: There is no doubt that in Central Europe *Agelastica alni* feeds on *Alnus glutinosa* and *Alnus incana* only and not on *Alnus alnobetula*, the third *Alnus* species here. This shrub grows at higher altitudes, in subalpine regions, whereas *Agelastica alni* only occurs at low altitudes. In the Gastein Valley (Hohe Tauern, Austria), at 850 m and above, no *Agelastica alni* could be found on *Alnus incana*, but several other chrysomelids on *Alnus* (C. Herr, in litt.). The record of *Prunus mahaleb* clearly seems to be incorrect. “Other *Alnus*” may be correct in other areas outside Central Europe.

### *Sermylassa halensis* (L., 1767)

Subfamily: Galerucinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Uncertain feeding scars on: *Galium mollugo.*

No feeding scars on: *Centaurea jacea*, *Trifolium repens*, *Ranunculus flammea*, *R. repens*, *Lythrum salicaria*, *Plantago lanceolata*, *Mentha arvensis*, *Polygonum bistorta*, *Pimpinella major*, *Leontodon*, *Galeopsis speciosa*, *Epilobium*, *Veronica beccabunga*, *Rumex obtusifolius*, *Leucanthemum ircutianum*, *Achillea millefolium*, *Heracleum sphondylium*, *Lycopus europaeus*, *Taraxacum officinale.*

**Host plants recorded**: *Galium*, but also records from *Salix*, *Melampyrum*, *Rosa* (MOHR 1966). *Galium mollugo* (STEINHAUSEN 1994). *Galium mollugo*, *G. verum*, also on *Salix aurita* and

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[2] This species is better known as *Alnus viridis.*

*Melampyrum arvense* (FRANZ 1974). *Galium* (KASZAB 1962). *Galium*, but also on *Melampyrum*, *Euphorbia*, *Tanacetum*, *Calluna*, *Salix*, and *Rosa* (KOCH 1992).

**Comments**: In this case only one specimen of this beetle was collected with the landing net and used for the feeding choice experiments. It cannot be excluded that the small feeding scars on *Galium mollugo* derived from other herbivores, feeding on it before. *Galium* seems to be the host plant, the other plants recorded in the literature are typical for the habitat of *S. halensis*, on which they often sit.

### *Altica palustris* (WEISE, 1888)

[*Haltica palustris* WEISE, 1888]

Subfamily: Alticinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Lythrum salicaria*, *Epilobium.*

No feeding scars on: *Polygonum persicaria*, *P. hydropiper*, *P. bistorta*, *Rumex obtusifolius.*

**Host plants recorded**: *Lythrum salicaria*, *Epilobium parviflorum* (MOHR 1966). *Epilobium hirsutum* (STEINHAUSEN 1994). *Epilobium hirsutum*, *E. montanum*, *E. palustre*, *E. parviflorum*, *E. roseum*, *E. tetragonum*, *Lythrum salicaria* (DOGUET 1994). *Lythrum salicaria*, *Epilobium hirsutum* (FRANZ 1974). *Epilobium* (KASZAB 1962, HANDSCHIN 1963).

**Comments**: The result of the feeding choice experiment matches perfectly with the record in the literature. Also, *Lythrum salicaria* (Lythraceae) and *Epilobium* (Onagraceae) are closely related.

### *Crepidodera aurata* (MARSHAM, 1802)

[*Chalcoides aurata* (MARSHAM, 1802)]

Subfamily: Alticinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Salix fragilis*, *S. cinerea.*

No feeding scars on: *Prunus padus*, *Corylus avellana*, *Alnus glutinosa.*

**Host plants recorded**: *Salix* and *Populus* (MOHR 1966, FRANZ 1974, KOCH 1992). *Salix* (STEINHAUSEN 1994). *Salix alba*, *S. aurita*, *S. caprea*, *S. cinerea*, *S. pentandra*, *S. pupurea*, *S. triandra*, *S. viminalis*, *Populus alba*, *P. nigra*, *P. tremula* (DOGUET 1994).

**Comments**: *Crepidodera aurata* clearly feeds on a variety of *Salix* and *Populus* species, whereas other *Crepidodera* species are restricted to only a few species of these plant genera (ALLEN 1972).

### *Cassida rubiginosa* (MUELLER, 1776)

Subfamily: Cassidinae.

Distribution area: Palearctic.

Result of the feeding choice experiment:

Feeding scars on: *Cirsium oleraceum.*

No feeding scars on: *Leucanthemum ircutianum*, *Achillea millefolium* agg., *Bellis perennis*, *Centaurea jacea*, *Crepis biennis*, *Leontodon autumnalis*, *Matricaria chamomilla*, *Ranunculus acris.*

**Host plants recorded**: *Carduus*, *Cirsium* and *Arctium* (MOHR 1966, KOCH 1992). *Carduus acanthoides*, *Cirsium spinosissimum* (STEINHAUSEN 1994). *Carduus* and *Cirsium* (KASZAB 1962, FRANZ 1974). BORDY (2000) specifies several species of *Carduus*, *Cirsium* and some other Asteraceae, like *Arctium lappa* and *Centaurea jacea*.

**Comments**: The records of *Cirsium*, *Carduus*, and *Arctium* are reliable, they are closely related genera. *Cassida rubiginosa* seems to be restricted to these genera, since it did not feed on the other Asteraceae displayed in the experiment.

### *Cassida leucanthemi* (BORDY, 1995)

Subfamily: Cassidinae.

Distribution area: Europe.

Result of the feeding choice experiment:

Feeding scars on: *Leucanthemum ircutianum.*

No feeding scars on: *Cirsium oleraceum*, *Achillea millefolium* agg., *Bellis perennis*, *Centaurea jacea*, *Crepis biennis*, *Leontodon autumnalis*, *Matricaria chamomilla.*

**Host plants recorded**: *Leucanthemum vulgare* (KIPPENBERG 1998, BORDY 2000).

**Comments**: *Cassida leucanthemi* was described only recently on *Leucanthemum vulgare*. Now it has been proved that *C. leucanthemi* feeds on the closely related *Leucanthemum ircutianum*, too, but not on the other displayed Asteraceae.

## Discussion

Although very few and – in most cases – very common chrysomelids were investigated, this small set of species shows the gist of the host plant problem very clearly. The records in the literature which is widely used are incorrect to some extent even in very common species (e.g. *Chrysolina fastuosa*), or only a part of the host plants (e.g. *Altica palustris*) are mentioned. It can also be assumed that knowledge of the host plants will be even less on rare chrysomelids that means about 30% or up to 200 species in Austria alone, and also on species with a distribution area outside Central Europe.

The feeding choice experiments and the comparison with the records in the literature showed that the chrysomelids only feed on some species of the mentioned plant families (e.g. "Poaceae") or genera (e.g. "*Ranunculus*"), but it would be very difficult to narrow down that knowledge to the exact plant species in most cases. For more exact results it would be necessary to rear the beetles for several generations, as was done by STAGL (1978) with *Gastrophysa viridula.*

Not only do chrysomelids sometimes feed on different plant species in spring, before oviposition, in autumn and so on. Plant species also contain different compounds in different amounts in different months, and in young and old leaves at the same time. All theses factors affect field observation and laboratory experiments.

The degree of attraction of an individual plant to the chrysomelids differs to a remarkable extent. It can often be observed that chrysomelids feed on one individual plant (e.g. *Salix*, *Alnus* or herb species) very intensely and on the other individuals of the same plant species in the same habitat to only a slight extent.

Another problem is the "plant species" itself. There are not only different plant species, but also different opinions about what are distinct species or not. Different botanists prefer different systematic classifications. Furthermore, many of the real plant species produce hybrid forms. The chrysomelids seem to manage systematic problems very pragmatically: if the individual plant contains the ingredients the chrysomelid relies on (and furthermore no toxic compounds which it cannot neutralize), it feeds on it, irrelevant of the detailed systematic position of that plant. This seems to be the case of the two host plant species of *Cassida leucanthemi*: *Leucanthemum vulgare* and *L. ircutianum*, which in some classifications are united with other *Leucanthemum* taxa as *Chrysanthemum leucanthemum*.

The object of these feeding choice experiments was not to solve the complex problems of the host plants, but to find out, what plants the collected chrysomelids feed on in that particular investigated area. In most studies for conservation purposes only an uncritical compilation of records from literature are used as host plant information.

A deeper study of the host plant problem could provide interesting results. *Chrysomela lapponica* was known to feed on *Betula* and *Salix*. In a comprehensive study, GROSS et al. (2004) discovered that the beetles feed either on *Betula* or on *Salix*, and these two groups have clear reproductive barriers. That means in terms of biology that they are two different species. The difference between the host plants of groups of *Phaedon armoraciae* and of *Prasocuris phellandrii* may indicate a similar situation.

There are no quick answers to this simple question: what are the host plants of a particular chrysomelid species? By comparing the records of several books in the main literature it is possible to narrow down the answer for practical use in most cases. But a lot remains to be investigated in the future.

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