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Xero-thermophilous and grassland ubiquist species dominate the weevil fauna of Swiss cities (Coleoptera, Curculionoidea)

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The phytophagous group of weevils (Curculionoidea) was sampled in the three Swiss cities of Lucerne, Lugano and Zurich. In total, 3448 individuals from 129 species were collected (Lucerne: 64 species; Lugano: 69 species; Zurich: 83 species). The most dominant species were the xero-thermophilous *Protapion trifolii* and the ubiquist *Tychius picirostris*. Most of the 13 dominant and subdominant species found in the three cities live on Fabaceae. Species similarity (Soerensen index) was highest between the cities of Lucerne and Zurich, which could be expected since they belong to the same biogeographical region (Midlands). The occurrences of five weevil species that are worthy of note with regard to the Swiss fauna are discussed in detail. For two of the species – *Ceutorhynchus leprieuri* and *Hypophyes pallidulus* – their capture in Switzerland is only the 2nd confirmed occurrence since they were first reported 87 and 170 years ago, respectively. The sampling of the blind edaphic *Ferreria marqueti* in urban environments in Lucerne and Zurich confirm that individuals captured in Switzerland are displaced specimens. A further six species were recorded for the first time in the two biogeographical regions of the Midlands and Southern Switzerland. A complete species list is presented.

Keywords: Switzerland, biodiversity, urban environment, urban habitat, faunistics

INTRODUCTION

The urban environment is one of the most steadily increasing habitats in Switzerland and in the World (Schuler *et al*. 2004, United Nations 2000). Urban areas increased in Switzerland by 327 km^2 between 1982 and 1995, and the urbanisation process is continuing. The built area in Switzerland comprises 2'800 km^2 (7 % of the total surface) and in the Swiss Midlands region, the built area has reached 1'620 km^2 (15 %), (Bundesamt für Raumentwicklung 2005, Bundesamt für Statistik 2005). It is therefore important to include urban areas when undertaking faunistical surveys so that a complete picture of the diversity and distribution of the taxonomic group under consideration is obtained.

Weevils sensu lato (Curculionoidea) represent one of the most species rich Coleopteran groups in Switzerland with more than 1050 species. Many new findings, as well as changes in systematics and taxonomy, have added to the diversity of this important group in Switzerland (Germann 2006b) since the publication of

Tab. 1: Location and size of the three cities investigated in the framework of the project BiodiverCity: Lucerne, Lugano and Zurich.

Cities investigated (number of trap sites)	**Lucerne** (n = 34)	**Lugano** (n = 36)	**Zurich** (n = 36)
Canton	Lucerne	Ticino	Zurich
Biogeographical region	Midlands	Southern Alps	Midlands
Geographical Coordinates	47°03'N 8°18'E	46°00'N 8°57'E	47°22'N 8°33'E
Area	24 km²	26 km²	92 km²
Elevation a.s.l.	436 m	273 m	408 m
Inhabitants (December 2005)	57'533	49'223	366'809

the last comprehensive lists by Stierlin & Gautard (1867) and Stierlin (1898). Until very recently, new weevil records from urban environments in Switzerland have remained scarce and accidental. However, no less than 7 weevil species (Germann 2004, 2005, 2006a, 2006b, 2006c, 2007) that are new to the Swiss fauna have been recorded exclusively from urban environments since 2004.

Weevils were included in the first comprehensive work on urban habitats and their fauna in Central Europe (Klausnitzer 1988). An analysis of species composition, based on plentiful data collected by Cholewicka (1981) in the city of Warsaw, provided first insights into the urban weevil fauna and showed both a strongly decreasing number of species and an increasing proportion of grassland species towards the city centre. Most recent studies in urban Central Europe either deal with single weevil species (e.g. Bayer 2001: *Ceutorhynchus canaliculatus*; Sprick *et al.* 2002: *Rhopalapion longirostre*; Germann *et al.* 2005b: *Otiorhynchus crataegi* and *Pachyrhinus lethierryi*), cover only a small amount of total weevil diversity (Kaupp *et al.* 2004: 19 species found on vegetated roofs in Basel; Flechtner & Klinger 1991: 15 species found in Frankfurt/Main; Kadas 2006: 13 species found on green roofs in London), or present results of accidental captures (Gosik 2007: weevils found on sticky traps in Lublin). Recently, a study of insect-diversity was done in the Zoo of Basel, where weevils were represented by 41 species (Sprecher *et al.* 2008).

This paper fills a gap in the knowledge of the weevil fauna in urban environments in Switzerland, where current data is almost lacking. We give a short overview of dominance, structure, and frequency of urban weevils in the three Swiss cities Lucerne, Lugano, and Zurich. The data presented includes new species occurrences for bio-geographical regions of Switzerland. We discuss the most interesting findings with respect to the Swiss fauna and present a complete species list in the appendix. This contribution forms part of the BiodiverCity project (www.biodiver-city.ch; Moretti 2005) that aims to assess biodiversity in urban environments and its acceptance by citizens in the framework of the national research programme «Sustainable development of the built environment» (www.nfp54.ch).

MATERIAL AND METHODS

The study took place in three Swiss cities, namely Lucerne, Lugano, and Zurich in 2006 (Tab. 1, Figs 1–3). A total of 106 sampling locations were chosen, with 34 locations in Lucerne and 36 each in Lugano and Zurich. In each city, 32 locations were chosen to cover the widest variability possible along the three gra-

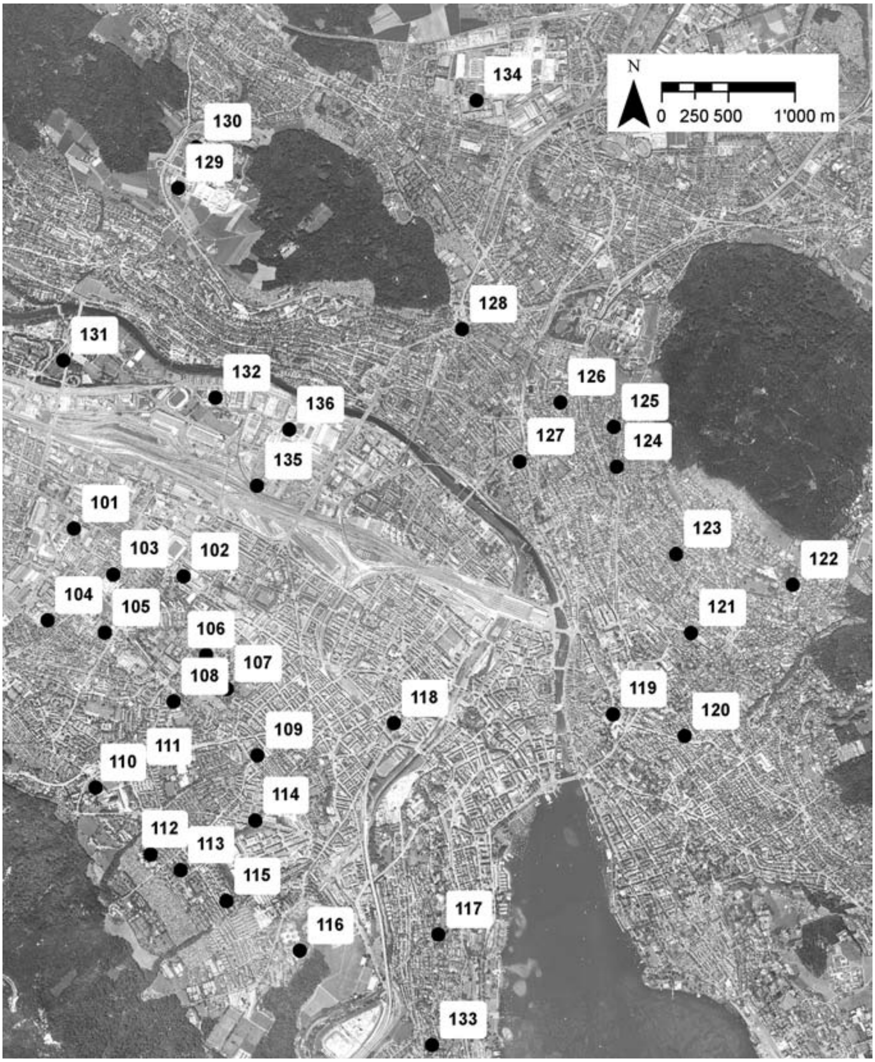

Fig. 1: Sampling locations in the city of Zurich (n=36). Swissimage © 2008 swisstopo (DV033492).

dients «age of green area», «sealed area» (in a radius of 25 m around trap), and «human management» (measured by the amount of meadow mowing within 5 m of the trap). The remaining 2 sampling locations in Lucerne and the 4 in Lugano and Zurich were selected in ruderal areas.

Weevils were sampled using standard sampling methods (Duelli *et al.* 1999). Litter dwelling species were sampled using pitfall traps, which consisted of 3 plastic beakers recessed into the soil (opening diameter 75 mm; arranged in an isosceles triangle with a distance of one meter). Transparent roofs installed approximately 8

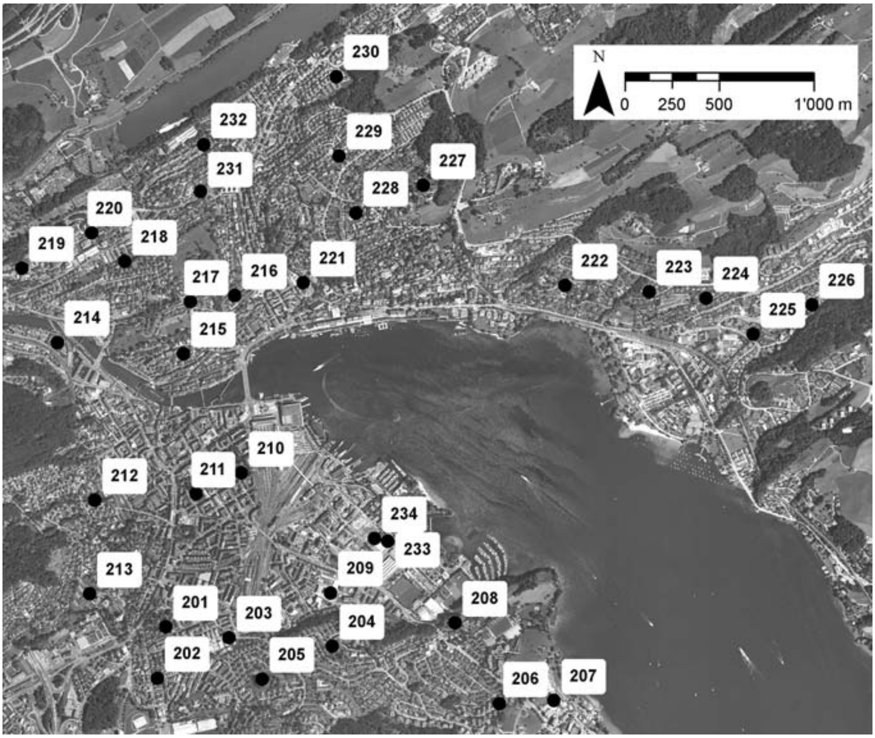

Fig. 2: Sampling locations in the city of Lucerne (n=34). Swissimage © 2008 swisstopo (DV033492).

cm above the beakers provided protection from the rain. Flying and flower visiting species were sampled using so called combination traps, i.e. non-directional window traps in combination with a yellow water pan placed at a height of 1.5 m above ground. Both, pitfall and combination traps, were filled with the same 0.2 % Metatin (bactericide) solution. One trap set, consisting of three beakers and one combination trap, was installed at each of the 106 locations. The minimum distance between two locations, and between each individual location and the town margin was at least 250 m. The sampling period was in accordance with the Rapid Biodiversity Assessment, for which the seven weeks with the presence of most insect species had been determined (Duelli & Obrist 2005). Traps were installed in week 23 (between June 13th and 15th) and then emptied weekly during seven weeks until week 31 (closure between August 1st and 3rd).

Soerensen index and Dominance indices (DI) are calculated after Mühlenberg (1989) and classification of the different dominance levels follows the logarithmic scale proposed by Engelmann (1978), with the modification that the eudominance level is not indicated here (i.e. dominant > 10 %; subdominant 3.2–10 %; minor species < 3.2 %).

The frequency (F) expresses the fraction of sample locations per city where the species was found (100 % = 36 locations in Zürich and Lugano; 100 % = 34 locations in Lucerne).

The first author identified the weevil species. Nomenclature follows the propositions in the catalogue by Alonso-Zarazaga & Lyal (1999, 2002) with respect to the genus-level, and details concerning the species level are taken from Alonso-Zarazaga (2007). The species occurrence in Switzerland is shown according to the six different Swiss biogeographic regions as defined by Gonseth *et al*. (2001). Specimens of the five species that are exceptional for the Swiss fauna are deposited in the Lucerne Nature Museum.

RESULTS AND DISCUSSION

A total of 3448 individuals representing 129 species were found (Lucerne: 64 species (min 1, max 15 per sample location), 841 individuals; Lugano: 69 species (min 1, max 11), 840 individuals; Zurich: 83 species (min 2, max 16), 1767 individuals). Overall, 22.5 % (29 species) of the species were found in all three cities, 20.9 % (27 species) in two of them, and 56.6 % (71 species) were exclusively found in one city (Appendix 1). In the course of this study, six weevil species were found in a biogeographical region where they had not been found previously. In the Midlands (North of the Alps) one, and in the Southern Alps (canton of Ticino) five species were found for the first time (Table 2).

We experienced some trap failures due to storms or to intentional damage to elements of some trap sets. However, for the purpose of this study, the samples of single locations of each city were pooled and have been analysed on city level. The losses of individuals on city level are estimated to total up to 0.7 % for Lucerne, 3.9 % for Lugano and 1.6 % for Zurich. Based on the asymptotic relationship between individuals and species, the number of species missed per city by these losses is a fraction of these percentages and in all cases less than 0.5 %. Therefore we consider the losses negligible and we have continued to use the original data for the analysis.

Although the number of species found per city is comparable to other studies in urban habitats, direct comparison with other studies is difficult because the sampling period was short (7 weeks) in this study and/or other sampling methods were applied in potentially comparable studies. In contrast to the standardized sampling scheme implemented in our study, experienced specialists often collect weevils actively, which can reveal many species within a short time. While acknowledging difficulties in comparison caused by different sampling efforts and different sampling sizes, species numbers in other cities start at 31 (Lau 1975, Zoological Garden Berlin) and 41 (Sprecher *et al*. 2008, Zoological Garden Basel) and peak at 193 (parks of Warsaw, but only 33 species in the city centre), and 210 in Lublin (Klausnitzer 1988, overview of both cities). However, intensive sampling of Curculionoidea in urban habitats (including adjacent areas) may result in many more species as shown for Berlin with 521 species (Winkelmann 1991) or for the small Swiss Canton of Geneva (which is dominated by urban area), where 661 species were registered (Germann, unpublished).

The comparison of the weevil species composition between the three cities based on the Soerensen index revealed that Lucerne and Zurich, which are both located in the biogeographical region Midlands, showed the highest similarity (these cities share 60.3 % of the species), whereas lower similarity values were found for the comparison between Lugano (biogeographical region Southern Alps) and the

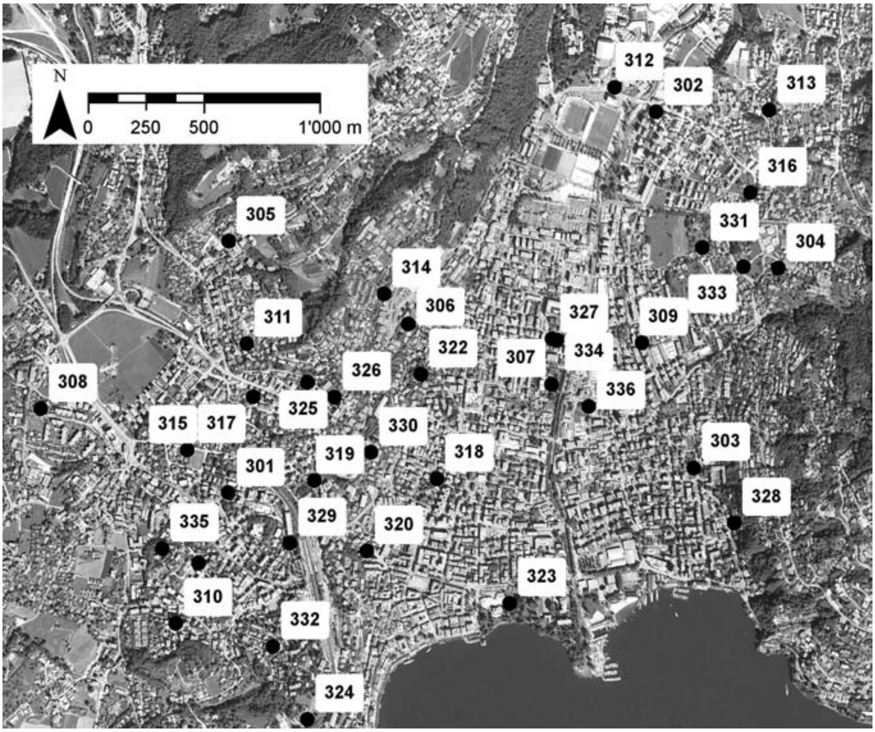

Fig. 3: Sampling locations in the city of Lugano (n=36). Swissimage © 2008 swisstopo (DV033492).

two Midlands cities (Lugano-Lucerne: 50.0 %; Lugano-Zurich: 49.4 %). These differences are consistent with our expectations, since the particular insubric climate (i.e. wet, warm summers and mild, dry winters) and the proximity of the Mediterranean region affect the species composition of Lugano and the Alps hinder faunal exchange.

The species dominance rank distribution indicates that the weevil community in all three cities is mostly dominated by a single species (*Protapion trifolii*), which accounts for 25 % or more of all individuals found (Lucerne: 25 %; Lugano: 44 %; Zurich: 30 %). *Tychius picirostris* is dominant in Zurich (13 %) and subdominant in Lucerne (8 %) and Lugano (6 %). Other subdominant species included *Barypeithes pellucidus* (Lucerne 7 %; Zurich 3 %) and *Otiorhynchus porcatus* (Lucerne 3 %; Zurich 4 %), although both species were absent in Lugano, as well as *Tychius pusillus* (Zurich 3.5 %, but which was scarce in Lucerne and Lugano). Dominant and subdominant species are marked in bold in the species list (Appendix 1).

The dominance of *Protapion trifolii*, the occurrences of *Tychius pusillus* and *Squamapion flavimanum* in all three cities, and the occurrence of *Trichosirocalus rufulus* in Zurich (5 individuals) were unexpected, since all four species were considered to be restricted to natural habitats such as calcareous grasslands (Mesobromion and Xerobromion) in Switzerland. An explanation for the occurrence of

Tab. 2: The following 6 species of Curculionoidea were recorded for the first time for the respective biogeographical region in Switzerland during the project BiodiverCity. The numbers below the biogeographical regions are the number of specimens sampled (listed in alphabetical order).

Family/genus/species	**Biogeographical region**	
	Midlands	**Southern Switzerland**
Curculionidae		
Ceutorhynchus leprieuri C. Brisout, 1881	2	
Magdalis memnonia (Gyllenhal, 1837)		1
Magdalis rufa (Germar, 1824)		2
Xylosandrus germanus (Blandford, 1894)		1
Dryophthoridae		
Sitophilus zeamais Motschulsky, 1855		1
Nanophyidae		
Hypophyes pallidulus (Gravenhorst, 1807)		3

these xero-thermophilous and rarely found species (with the exception of the common *P. trifolii*) could be that the climate in urban habitats is comparatively warm and dry. These findings are consistent with the results of other studies that comprise various beetle taxa (e.g. Kaupp *et al.* 2004) and with the general idea that the urban microclimatic condition favours species relying on higher ambient temperatures (Cholewicka 1981).

The occurrences of the remaining dominant and subdominant species are consistent with our expectations as they are common species associated with grassland habitats, especially with the wide spread grassland-type Arrhenaterion (Germann *et al.* 2005a) or polyphagous ubiquists such as *Otiorhynchus porcatus* or *Barypeithes pellucidus*. The findings of the polyphagous *B. pellucidus* in Lucerne and Zurich support the strong affinity of this species to urban environments, as mentioned in Klausnitzer (1988), and is further supported by new data from Basel (Sprecher *et al.* 2008). In the latter study, the species was eudominant and represented more than 50 % of the individuals from among the 41 species sampled.

The ten most common species sampled in the three cities live on host plants belonging to the Fabaceae, with the exception of the two polyphagous species (*Otiorhynchus porcatus* and *Barypeithes pellucidus*) and *Anthonomus rubi* that lives on Rosaceae. The dominance of Fabaceae-related species living in the urban environment is consistent with those that occur in the natural- and seminatural (agricultural) environments.

The frequency distribution of the species sampled was calculated to obtain a value describing the regularity of the species' occurrences within each city (Appendix 1). All seven species that were found at $F \geq 50$ % were either subdominant or dominant species. The most dominant species *Protapion trifolii* was found with high frequency ($F \geq 70.6$ %) in all three cities. The three subdominant species *Barypeithes pellucidus*, *Otiorhynchus porcatus* and *Tychius meliloti* show lower frequency values ($F = 8.8$–44.4 %). We suspect the preference of *O. porcatus* for shaded and more humid conditions explains its irregular occurrence, as this habitat type is not commonly found in the urban environment. The irregular occurrence of *T. meliloti* might be explained by its patchily distributed host plant *Melilotus* sp., which mostly grows on ruderal sites.

We now give detailed information on the occurrence of five selected species in alphabetical order. Three of them were found in a biogeographical region for the first time, one was found only for the second time and in an area of a region where it had not been recorded previously (*Otiorhynchus pinastri*) and one is discussed because of the ongoing debate about its origin (*Ferreria marqueti*):

Ceutorhynchus leprieuri Brisout, 1881

The reported finding of this species in the Canton of Ticino by Künnemann (1920) was the first and only record in Switzerland. The two specimens found in this study represent the first records in the biogeographic region Midlands, which confirms the occurrence of this species in Switzerland 86 years after its first observation. Due to its widespread distribution in the surrounding contries, the occurrence of *Ceutorhynchus leprieuri* in the Midlands had been expected for quite some time.

Ferreria marqueti (Aubé, 1863)

Ferreria marqueti is a blind edaphic species of mainly Mediterranean origin which was reported in Switzerland by Fontana (1947) near Chiasso in the Canton of Ticino and Besuchet (1964) in the Lac Léman region (Western Switzerland). In February 2007, a single male of *F. marqueti* was found in Basel (Rheinhalde) in Northern Switzerland. Two additional specimens were then found in the Basel Zoo (Sprecher *et al.* 2008). In the present study, two individuals were found in Lucerne and one in Zurich. Following the Rheinhalde finding in 2007, the media speculated that *F. marqueti* could have survived the ice ages in the ice free zone of Basel and thus represents a relic species from the tertiary period (Basler Zeitung: 7th and 16th of March 2007, Neue Zürcher Zeitung: 7th of March 2007, Tages-Anzeiger: 7 th of March 2007 and critical remarks by Jedicke (2007a, b)). This speculation is contradicted by the occurrence of *F. marqueti* in Lucerne and Zurich, which were both covered by ice during the ice age. A more likely explanation is that *F. marqueti* has been introduced to the study region by human activity. Owen (1997) suspected transport within soil or among roots of garden shrubs as the reason for the presence of this species in England. This hypothesis is supported in that specimens were found in gardens within cities where plants and soil have been continuously imported by human activity. We agree with Sprecher *et al.* (2008) that the relic hypothesis should definitely be considered as very unlikely.

Hypophyes pallidulus (Gravenhorst, 1807)

Hypophyes pallidulus had only been previously found in the Valais (Southwestern Switzerland) by Stierlin & Gautard (1867), Favre (1890) and Stierlin (1898). However, these reports are unconvincing as the main distribution of this species lays in the Mediterranean region. More recently, three specimens of *H. pallidulus* were rediscovered in the Natural History Museum of Geneva (2 ex. Geneva, coll. Tournier. 1 ex. Valais, coll. Melly) by Germann (unpublished data). All the specimens are from the ancient collection (before 1900) and therefore the indications on the labels are doubtful since inaccurate labelling has been reported for other taxa (e.g. Marggi 1992: Carabidae). Hoffmann (1958) states that *H. pallidulus* lives on *Tamarix africana* Webb. and *T. gallica* L. (Tamaricaceae), neither of which occur naturally in Switzerland.

The discovery of three specimens of *Hypophyes pallidulus* in Lugano, 170 years after the first doubtful record, confirms the occurrence of the species in Switzerland. Furthermore, this is the first reported occurrence in Southern Switzerland. However, the existence of a viable population of *H. pallidulus* still remains questionable due to the absence of the host plant (*Tamarix* spp.). The records from Geneva and Valais point to the possibility that *H. pallidulus* may also accept *Myricaria germanica* (L.) Desv. as a host plant, as *Myricaria germanica* is the only Tamaricaceae species occurring in the area. A further possibility is that *H. pallidulus* might live on *Tamarix* spp., which are cultivated in gardens as ornamental plants. Both hypotheses need further investigation.

Otiorhynchus pinastri (Herbst, 1795)

The species, found in a single specimen in Zurich, is a neobiont in Switzerland. It originates from Eastern Europe and individuals have been captured in Switzerland since 1979 (Germann 2004). Until this discovery in Zurich, it had been found only in the Canton of Bern (Germann 2006b).

Sitophilus zeamais Motschulsky, 1855

A review of the collections in the Natural History Museum of Bern produced the following discoveries, as an amendment to the specimens presented by Germann (2007: 182): 2 ex. Bern, Biel, 1.1916, leg. A. Mathey. 1 ex. Basel, 25.5.1974, leg. F. Straub. 11 ex. Bern, Stadt Bern, 12.4.1985. 1 ex. Ticino, Arzo, «par battage», 30.6.1988, leg. P. Scherler. 1 ex. Ticino, Somazzo, 27.6.1990, leg. P. Scherler, 6 ex. Bern, Orpund, «in Reis aus Thailand», 20.12.2001, leg. R. Naef.

These 22 specimens from Midlands and Southern Switzerland show that *S. zeamais* has been present in Switzerland since 1916. In this study we recorded the species in Lugano which provides further evidence of this species in Southern Switzerland and adds to the previously reported Swiss records from Geneva and Basel (Germann 2007). This synanthropic and cosmopolitan species is a pest in crop products and its presence in Switzerland is not surprising as corn and rice have been traded worldwide for a long time.

CONCLUSIONS

This study provides the first discussion of the weevil fauna in urban habitats in Switzerland. Altogether, 129 weevil species were found in Lucerne, Lugano, and Zurich. Despite the short sampling period (seven weeks in June and July), the results show that weevil species richness in the three Swiss cities is rather high, peculiar, and dominated by a xero-thermophilous species (*Protapion trifolii*) that is likely to find suitable habitats due to the warm and dry conditions in the urban environment. The rediscovery of two species (*Ceutorhynchus leprieuri* and *Hypophyes pallidu-*

lus) in Switzerland after 87 and 170 years respectively, indicates that the urban environment hosts a unique species composition. This particular species composition appears to be the result of two distinct phenomena. Firstly, the dense mosaic of different habitats and warm-dry climatic conditions within cities provide a habitat in which highly specialised species as well as neobionts can survive. Secondly, individual colonists are introduced involuntarily with the transport of soil and plants, which is shown by the presence of the blind edaphic *Ferreria marqueti* in cities north of the Alps.

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Appendix 1: Number of individuals of the 129 Curculionoidea species (in alphabetical order) sampled in the cities of Lucerne, Lugano and Zurich from 12th of June to 3rd of August 2006 in pitfall- and combination traps (see Methods). Species numbers are marked as follows: dominant species (> 10 %) are in bold with an asterisk, subdominant species (3.2-10 %) are in bold. The frequency (F, see methods for calculation) is indicated in % on the right side in each column, values of 50 % or more are in bold. Nomenclature by the catalogue of Alonso-Zarazaga & Lyal (1999, 2002), details on the species-level by Alonso-Zarazaga (2007).

Genus/species	**Cities**						**Total**
	Lucerne	F (%)	Lugano	F (%)	Zurich	F (%)	
Anthribidae							
Bruchela rufipes (Olivier, 1790)					1	2.8	1
Apionidae							
Aspidapion radiolus (Marsham, 1802)	2	5.9					2
Betulapion simile (Kirby, 1811)	5	11.8	21	30.6	5	11.1	31
Catapion meieri (Desbrochers, 1901)					1	2.8	1
Catapion pubescens (Kirby, 1811)			2	2.8	2	5.6	4
Catapion seniculus (Kirby, 1808)	5	5.9	16	19.4	24	27.8	45
Ceratapion onopordi (Kirby, 1808)			1	2.8			1
Diplapion stolidum (Germar, 1817)			6	11.1			6
Eutrichapion ervi (Kirby, 1808)	1	2.9					1
Eutrichapion punctigerum (Paykull, 1792)	1	2.9			3	5.6	4
Eutrichapion vorax (Herbst, 1797)					1	2.8	1
Ischnopterapion loti (Kirby, 1808)					3	2.8	3
Ischnopterapion modestum (Germar, 1817)			1	2.8			1
Ischnopterapion virens (Herbst, 1797)	19	23.5	10	19.4	**87**	38.9	116
Malvapion malvae (Fabricius, 1775)	2	5.9	1	2.8	3	8.3	6
Oxystoma ochropus (Germar, 1818)					1	2.8	1
Protapion apricans (Herbst, 1797)	**36**	38.2	15	25	**137**	41.7	188
Protapion assimile (Kirby, 1808)	**30**	26.5	5	8.3	48	33.3	83
Protapion fulvipes (Fourcroy, 1785)	**38**	47.1	**26**	36.1	52	**61.1**	116
Protapion nigritarse (Kirby, 1808)			3	2.8	2	5.6	5
Protapion ononidis (Gyllenhal, 1827)			6	5.6			6
Protapion trifolii (Linné, 1768)	*** 104**	**70.6**	*** 117**	**75**	*** 536**	**83.3**	757
Protapion varipes (Germar, 1817)			1	2.8			1
Pseudapion moschatae (Hoffmann, 1938)					3	8.3	3
Pseudapion rufirostre (Fabricius, 1775)			1	2.8	1	2.8	2
Rhopalapion longirostre (Olivier, 1807)			1	2.8			1
Squamapion flavimanum (Gyllenhal, 1833)	6	5.9	1	2.8	11	16.7	18
Stenopterapion tenue (Kirby, 1808)					1	2.8	1
Taeniapion urticarium (Herbst, 1784)			1	2.8			1
Attelabidae							
Attelabus nitens (Scopoli, 1763)	1	2.9	1	2.8			2
Curculionidae							
Anthonomus rubi (Herbst, 1795)	**41**	**50**	4	11.1	26	41.7	71
Archarius pyrrhoceras (Marsham, 1802)	2	5.9	1	2.8			3
Aulacobaris lepidii (Germar, 1824)	13	17.6			8	16.7	21
Aulacobaris picicornis (Marsham, 1802)					1	2.8	1
Bagous tempestivus (Herbst, 1795)	1	2.9					1
Barynotus moerens (Fabricius, 1792)	2	5.9					2
Barynotus obscurus (Fabricius, 1775)					1	2.8	1
Barypeithes araneiformis (Schrank, 1781)	2	5.9					2
Barypeithes pellucidus pellucidus (Boheman, 1843)	**55**	35.3			**60**	36.1	115
Barypeithes trichopterus (Gautier, 1863)	11	5.9			1	2.8	12
Ceutorhynchus leprieuri Brisout, 1881					2	2.8	2
Ceutorhynchus obstrictus (Marsham, 1802)	3	8.8	14	30.6	14	27.8	31
Ceutorhynchus pallidactylus (Marsham, 1802)					4	11.1	4
Ceutorhynchus typhae (Herbst, 1795)	5	14.7	7	19.4	10	22.2	22
Curculio nucum Linné, 1758	5	14.7	1	2.8	5	13.9	11
Donus zoilus (Scopoli, 1763)			1	2.8			1

Glocianus distinctus (C. Brisout, 1870)	4	11.8			4	8.3	8
Glocianus punctiger (Gyllenhal, 1837)					5	8.3	5
Graptus triguttatus triguttatus (Fabricius, 1775)	1	2.9					1
Gymnetron veronicae (Germar, 1821)	1	2.9					1
Hylesinus toranio (Danthoine, 1788)			1	2.8			1
Hylurgops palliatus (Gyllenhal, 1813)					1	2.8	1
Hypera meles (Fabricius, 1792)					2	5.6	2
Hypera nigrirostris (Fabricius, 1775)	1	2.9	2	5.6	12	11.1	15
Hypera postica (Gyllenhal, 1813)	1	2.9	1	2.8			2
Larinus obtusus Gyllenhal, 1836					2	2.8	2
Leiosoma deflexum (Panzer, 1795)	5	8.8			5	5.6	10
Liophloeus tessulatus (Müller, 1776)	1	2.9			2	5.6	3
Magdalis memnonia (Gyllenhal, 1837)			1	2.8			1
Magdalis rufa (Germar, 1824)			1	2.8	1	2.8	2
Mecinus circulatus (Marsham, 1802)			5	13.9			5
Mecinus pascuorum (Gyllenhal, 1813)			3	8.3			3
Mecinus pyraster (Herbst, 1795)	1	2.9	5	11.1	3	5.6	9
Mononychus punctumalbum (Herbst, 1784)	2	5.9			5	13.9	7
Orchestes fagi (Linné, 1758)	2	5.9					2
Orchestes testaceus (Müller, 1776)					1	2.8	1
Orthochaetes setiger (Beck, 1817)			1	2.8			1
Otiorhynchus crataegi Germar, 1824	1	2.9			3	8.3	4
Otiorhynchus frescati Boheman, 1843			6	11.1			6
Otiorhynchus ligneus (Olivier, 1807)					1	2.8	1
Otiorhynchus ovatus (Linné, 1758)			8	19.4	2	5.6	10
Otiorhynchus pinastri (Herbst, 1795)					1	2.8	1
Otiorhynchus porcatus (Herbst, 1795)	22	32.4			**66**	44.4	88
Otiorhynchus pupillatus Gyllenhal, 1834	3	2.9					3
Otiorhynchus raucus (Fabricius, 1777)	1	2.9					1
Otiorhynchus rugosostriatus (Goeze, 1777)	2	5.9			4	8.3	6
Otiorhynchus salicicola Heyden, 1908	1	2.9	1	2.8			2
Otiorhynchus singularis (Linné, 1767)					1	2.8	1
Otiorhynchus sulcatus (Fabricius, 1775)	3	2.9	1	2.8	5	2.8	9
Otiorhynchus uncinatus Germar, 1824	1	2.9					1
Otiorhynchus veterator Uyttenboogaart, 1932	1	2.9					1
Phyllobius betulinus (Bechstein & Scharfenberg, 1805)					1	2.8	1
Phyllobius maculicornis Germar, 1824					1	2.8	1
Phyllobius oblongus (Linné, 1758)					3	5.6	3
Phyllobius roboretanus Gredler, 1882					1	2.8	1
Polydrusus cervinus (Linné, 1758)			1	2.8			1
Polydrusus formosus (Mayer, 1779)	2	5.9			7	13.9	9
Polydrusus impressifrons Gyllenhal, 1834					1	2.8	1
Polydrusus pterygomalis Boheman, 1840	5	11.8					5
Rhinoncus bruchoides (Herbst, 1784)	5	8.8			4	11.1	9
Rhinoncus pericarpius (Linné, 1758)	6	11.8	1	2.8	1	2.8	8
Rhinoncus perpendicularis (Reich, 1797)			1	2.8	2	5.6	3
Rhinusa antirrhini (Paykull, 1800)					5	13.9	5
Rhinusa asella (Gravenhorst, 1807)	1	2.9					1
Rhinusa melas Boheman, 1838					1	2.8	1
Rhinusa neta (Germar, 1821)					4	11.1	4
Rhinusa tetra (Fabricius, 1792)			18	8.3	1	2.8	19
Rhyncolus punctatulus Boheman, 1838			1	2.8			1
Sciaphilus asperatus (Bonsdorff, 1785)	4	8.8	1	2.8	4	8.3	9
Sibinia pellucens (Scopoli, 1772)			2	5.6			2
Sibinia viscariae (Linné, 1761)			23	16.7			23
Sirocalodes depressicollis (Gyllenhal, 1813)			1	2.8			1
Sitona cambricus Stephens, 1831	3	5.9					3
Sitona hispidulus (Fabricius, 1777)	1	2.9	2	5.6	18	22.2	21

Sitona humeralis Stephens, 1831	10	5.9	1	2.8	2	2.8	13
Sitona lepidus Gyllenhal, 1834	*** 209**	**82.4**	16	22.2	**109**	**72.2**	334
Sitona lineatus (Linné, 1758)	1	2.9	1	2.8	17	27.8	19
Sitona sulcifrons argutulus Gyllenhal, 1834	**29**	26.5	*** 372**	**91.7**	54	19.4	455
Trachyphloeus angustisetulus Hansen, 1915			1	2.8			1
Trachyphloeus aristatus (Gyllenhal, 1827)			5	8.3			5
Trachyphloeus bifoveolatus (Beck, 1817)			4	8.3			4
Trichosirocalus rufulus (Dufour, 1851)					5	13.9	5
Trichosirocalus troglodytes (Fabricius, 1787)	11	8.8	1	2.8	18	25	30
Tychius breviusculus Desbrochers, 1873	3	2.9	1	2.8	8	16.7	12
Tychius meliloti Stephens, 1831	**28**	8.8	12	11.1	14	11.1	54
Tychius picirostris (Fabricius, 1787)	**64**	**73.5**	**54**	**55.6**	*** 235**	**88.9**	353
Tychius pusillus Germar, 1842	7	11.8	2	5.6	**62**	**72.2**	71
Tychius stephensi Schönherr, 1836			1	2.8	3	2.8	4
Xylosandrus germanus (Blandford, 1894)			1	2.8			1
Zacladus geranii (Paykull, 1800)					1	2.8	1
Dryophthoridae							
Sitophilus oryzae (Linné, 1763)					1	2.8	1
Sitophilus zeamais Motschulsky, 1855			1	2.8			1
Erirhinidae							
Tanysphyrus lemnae (Paykull, 1792)	1	2.9					1
Nanophyidae							
Hypophyes pallidulus (Gravenhorst, 1807)			3	8.3			3
Nanophyes brevis brevis Boheman, 1845	2	5.9			1	2.8	3
Nanophyes brevis fallax Rey, 1893			3	8.3			3
Nanophyes helveticus Tournier, 1867			9	22.2			9
Nanophyes marmoratus (Goeze, 1777)	3	5.9	1	2.8	2	5.6	6
Raymondionymidae							
Ferreria marqueti (Aubé, 1863)	2	2.9			1	2.8	3
Individuals/**total individuals**	841		840		1767		**3448**
Species/**total species**	64		68		82		**129**