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Recent Swiss records of rare bee species (Hymenoptera, Apidae) with two species new to Switzerland

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We report the capture of two bee species new to Switzerland, *Anthidium florentinum* (Fabricius, 1775) and *Stelis simillima* (Morawitz, 1876), and of three rare species, *Coelioxys echinata* (Förster, 1853), *Lithurgus chrysurus* (Fonscolombe, 1834) and *Lasioglossum discum* (Smith, 185). All specimens were collected within the city limits of Lugano in the course of the project «BiodiverCity» of the Swiss NRP54. Identical collecting efforts in the cities of Zürich and Lucerne did not yield any new or very rare bee species. The known distribution and ecology of the reported five prevalently Mediterranean species are summarized.

Key words: Hymenoptera, Apidae, wild bees, distribution, urban environment.

INTRODUCTION

Thanks to the investigations of several apidologists in the last decades, the faunistic composition of wild bees (Hymenoptera, Apidae) in Switzerland is relatively well known (Amiet 1996, Schwarz *et al.* 1996, Müller *et al.* 1997, Amiet *et al.* 1999, 2001, 2004, 2007 and in press). The occurrence of 610 wild bee species (Hymenoptera, Apidae) from 41 genera and 7 subfamilies is documented for Switzerland. However, the knowledge on the bee fauna in urban areas in Switzerland is still limited (F. Amiet and A. Müller, pers. communications) as this habitat type has rarely been included in faunistic surveys. This is even more true for the southern part of the Alps, where only a very limited number of bee studies have taken place (Amiet & Moretti 2002, M. Abderhalden, pers. comm.). The present study was part of a larger National Research Program (NRP54). In the project BiodiverCity, which investigates biodiversity and its human perception in urban landscapes, we captured bee species in the three Swiss cities Zürich, Luzern and Lugano, which for Central European standards are of small to medium size. We present two new species to the Swiss bee fauna (Hymenoptera, Megachilidae), indicate new findings of three rare bee species (Hymenoptera, Megachilidae, Halictidae), and discuss the question whether they are recent immigrants or had been overlooked so far.

Tab. 1. Species names and their synonyms.

Species	Synonyms
Anthidium florentinum (Fabricius, 1775)	*Anthidium florentinum* var. *hispanicum* Mocsary, 1884
	Anthidium florentinum var. *rufescente* Dusmet, 1908
	Anthidium florentinum var. *kissi* Alfken, 1935
	Anthidium subspinosum Klug, 1832
Stelis simillima (Morawitz, 1876)	*Stelis cognata* Kohl, 1892
	Stelis genalis Pasteels, 1969
Coelioxys echinata (F rster, 1853)	*Coelioxys rufocaudata* (Smith, 1854)
	Coelioxys octodentata (Lepeletier, 1841)
Lithurgus chrysurus (Fonscolombe, 1834)	*Chrysurus* var. *siculus* (P rez, 1897)
	Lithurgus haemorrhoidalis Lepeletier, 1841
Lasioglossum discum (Smith, 1853)	ssp. *discum* (Smith, 1853)
	Halictus discus Smith, 1853
	Halictus morbillosus Kriechbaumer, 1873
	Halictus morbillosus glasunovi Cockerell, 1924
	Halictus fertoni Vachal, 1895
	Lasioglossum pseudomorbillosum Ebmer, 1970
	ssp. *fertoni* (Vachal, 1895)

MATERIALS AND METHODS

This study was conducted on 106 sampling sites in the Swiss cities of Zürich (47°22 N, 8°31 E), Lucerne (47°05 N, 8°17 E), and Lugano (46°07 N, 8°56 E) from June 13th to August 3rd 2006. In Lucerne, 34 sampling locations were chosen, in Lugano and Zürich each 36. The locations were chosen to cover as widely as possible the total diversity along the three habitat quality gradients «age of green area», «sealed and built area» in a radius of 50 m, and «human management» (measured by the frequency of meadow mowing within 5 m around the trap).

Bees were sampled with one so-called combination trap (Duelli *et al.* 1999) and three pitfall-traps at each location. The combination trap combines a window interception trap with a yellow water pan and was placed at a height of 1.5 m above ground. The pitfall traps consisted of plastic cups recessed into the soil (opening diameter 75 mm), arranged in an isosceles triangle at a distance of one meter. Both, pitfall (for surface fauna) and combination traps (for flying insects) were filled with 0.2 % Metatin (bactericide) solution. The combination trap and the pitfalls were installed exactly the same way at each of the 106 sites. The minimum distance between sites within a single town, and between the sites and the town margin, was 250 m. All traps were operated for seven weeks (from 24 June to 8 August 2006) according to the Rapid Biodiversity Assessment scheme (RBA; Duelli & Obrist 2005). In this period of the growing season the highest fraction of insect species present can be assessed with the least effort. Traps were emptied weekly and the catches kept in 70 % alcohol. In the lab, the insects were sorted to order or family level.

Bee species were identified according to the bee identification keys provided for Switzerland (Amiet 1996, Amiet *et al.* 1999, 2001, 2004, 2007, and in press.). Additionally, single specimens could be verified in the bee collection at the Depart-

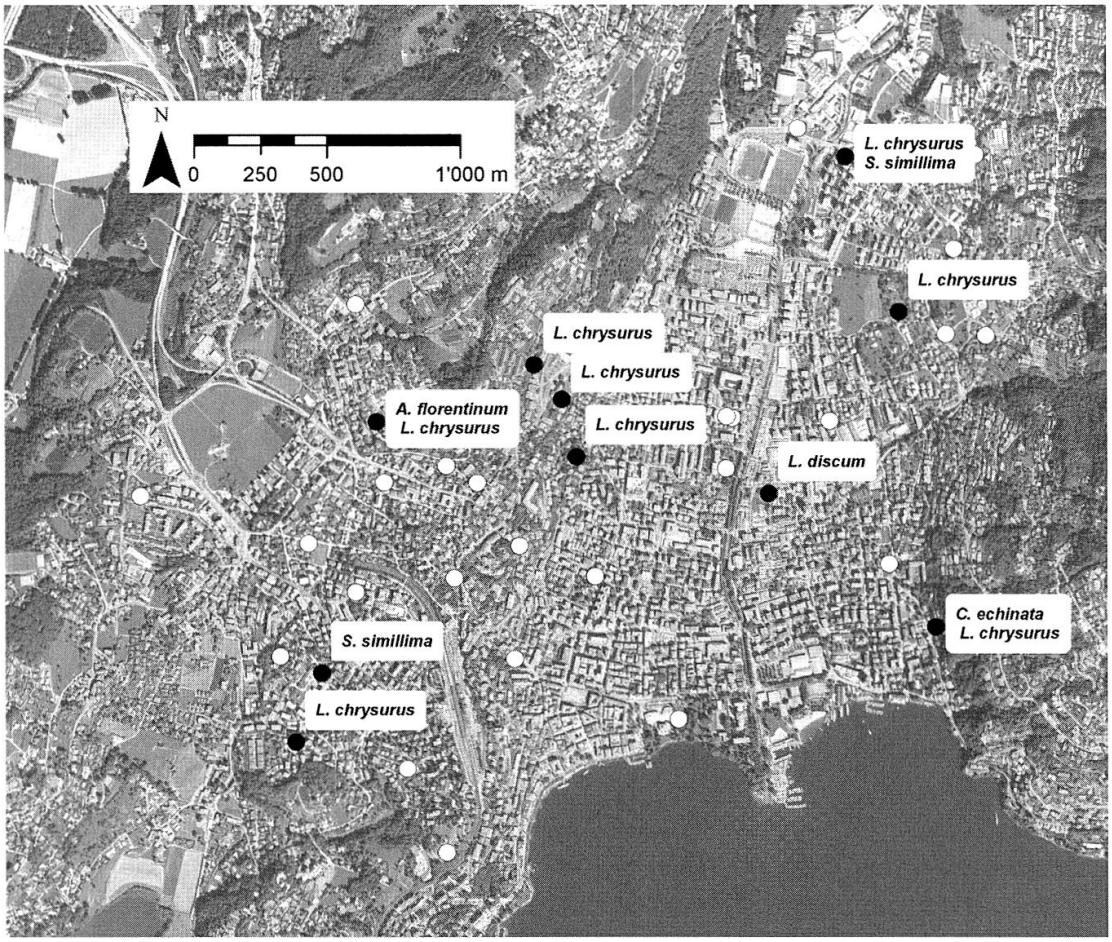

Fig. 1. Distribution in Lugano of rare species and species new to Switzerland. Black dots: locations with new or rare species; white dots: locations with no new or rare species.

ment of Applied Entomology of the Swiss Federal Institue of Technology in Zürich and in the private collections of A. Müller and F. Amiet, and were confirmed by these specialists. The nomenclature is following the same literature as used for identification. Detailed information on synonymous species names is given in Tab. 1.

RESULTS

The project BiodiverCity yielded a total of 142 species of Apoidea (104 in Lugano, 77 in Luzern, and 80 in Zürich) and a mean of 16.5 species per trap site. These data will be treated elsewhere. Here we focus on five very rare or new species for Switzerland. All these were found in the city of Lugano only (46°0 N, 8°56 E), the most southern of the three investigated cities. Trap locations and collecting data are given in Fig. 1.

Two species new to the Swiss fauna were collected: Of *Anthidium florentinum* (Fabricus, 1775), belonging to the family Megachilidae, a single female was found in the western part of Lugano. Two females of *Stelis simillima* (Morawitz, 1876), also belonging to the megachilid family, were trapped in the Northwest and South of Lugano.

Three species are very rare in Switzerland: A single female of the extremely rare species *Coelioxys echinata* (Förster, 1853) was found in southern Lugano.

Overall, twelve individuals of *Lithurgus chrysurus* (Fonscolombe, 1834) were captured at eight locations. While three females were recorded at three different locations, eight males were sampled at seven locations spread all over Lugano.

One specimen of *Lasioglossum discum* (Smith, 1853) was found on a ruderal area in the center of Lugano.

DISCUSSION

Had the two new species and the three very rare species been overlooked so far in Switzerland, or are they recent immigrants – maybe a testimony of global warming? Before giving a tentative answer to this question, we summarise what is known on the distribution and ecology of the five species.

Anthidium florentinum (Fabricius, 1775)

This bee species new to Switzerland is a predominantly Mediterranean species belonging to the family Megachilidae. In the North it reaches as far as Southern France (Rasmont *et al.* 1995; Banaszak & Romasenko 1998), its southern limits are found in Morocco (Friese *in* Rasmont *et al.* 1995; Warncke 1980; Wirtz *et al.* 1992). Thus the present record is the northern most observation of this species in its range. According to Müller (1996) and Banaszak & Romasenko (1998), *A. florentinum* is polylectic and forages pollen from Fabaceae and Lamiaceae as the preferred sources. However, the species preferred *Rubus* (Rosaceae) in Italy (Müller 1996). Its presence in Switzerland had to be expected, given its occurrence in the neighboring countries Italy and France. Thanks to its proximity to the Mediterranean region, the city of Lugano experiences a warm and dry climate from June to August. Such climatic conditions favour the occurrence of this univoltine species flying from June to August (Amiet *et al.* 2004).

Stelis simillima (Morawitz, 1876)

According to detailed studies of Müller (1996) and Amiet *et al.* (2004) *Stelis simillima* is a well known Mediterranean bee species. There is still no published information on its occurrence in Germany and Austria. The discovery of *S. simillima* was expected for Switzerland for quite some time (F. Amiet, pers. comm.) and was therefore included in the Apidae handbook of Switzerland (Amiet *et al.* 2004). *S. simillima* is a cleptoparasite of the genus *Lithurgus* (Banaszak & Romasenko 1998, Amiet *et al.* 2004). This species visits flowers for nectar only. It was reported to visit the Asteraceae *Centaurea solstitialis* (Rasmont *et al.* 1995). The two specimens were found more than two kilometer apart from each other, so they are likely to stem from different populations. They were found in the same locations where also their possible nest host *Lithurgus chrysurus* (Tab. 2 and Fig. 1) and several specimens of the genera *Anthidium*, *Chelostoma* and *Osmia* had been found (Kouakou *et al.*, unpublished data). According to Amiet *et al.* (2004), this univoltine species flies in July and August. Detailed information on synonymous species names is given in the Appendix.

Tab. 2. Bee species that are very rare or new to Switzerland and the coordinates of their respective locations in Lugano. * = new to Switzerland, ** = rare species

Species	Coordinates (Swiss grid system)
**Anthidium florentinum* Fab. 1 ♀	716502 / 97079
**Stelis simillima* Mor. 2 ♀♀	718269 / 98081 716294 / 96132
***Coelioxys echinata* För. 1 ♀	718608 / 96306
***Lithurgus chrysurus* Fon. 3 ♀♀, 8 ♂♂	718269 / 98081 717201 / 97164 716196 / 95873 716502 / 97079 717097 / 97295 717255 / 96948 718608 / 96306 718470 / 97494
***Lasioglossum discum* Smit. 1 ♀	717980 / 96810

Coelioxys echinata (Förster, 1853)

C. echinata has been found in Algeria, Morocco, Spain, Portugal, Caucasus, Russia, Sicily and Turkey (Ascher *et al.* 2007). The finding of a single female specimen of *C. echinata* in Lugano confirms its very rare presence in Switzerland, where it had been recorded only once since 1970, at Russin close to Geneva (Amiet *et al.* 2004). There are three old records from Ticino and Mesocco. The rediscovery of *Coelioxys echinata* in urban areas of southern Switzerland illustrates the capacity of urban habitats with their particular climate to sustain a variety of otherwise rare bee species. *C. echinata* parasitizes Megachilidae species, notably *Megachile apicalis* and *Megachile rotundata* (Amiet *et al.* 2004), as well as bees from the genera *Anthophora*, *Centris* and *Euglossa* (Michener 2000). This univoltine bee species is flying from July to August (Amiet *et al.* 2004).

Lithurgus chrysurus (Fonscolombe, 1834)

This species is widely distributed along the northern Mediterranean coast from Spain to Turkey and Israel, extending northwards to Germany, Slovakia and Austria, eastwards to the Caucasus and westwards to France (Ascher 2005). Six specimens of this species have been recorded until 1969, and since 1970 it was rarely collected in southern Switzerland (Amiet *et al.* 2004). After that it has been classified as critically endangered (Amiet 1994). *L. chrysurus* is strictly oligolectic on

Centaurea pollen (Rust *et al.* 2004) and flies from June to August. This new record of eleven specimens (3 females and 8 males) from eight locations in Lugano confirms its established occurrence in Switzerland and indicates that the species might have a wider distribution in Ticino than previously thought.

Lasioglossum discum (Smith, 1853)

This species, although very rare in Switzerland, has a wide distribution range including Morocco, Tunisia, Austria, Southern France, Israel, Italy, Spain, Kyrgyzstan, Romania, Slovenia, Turkey, and former Yugoslavia (Ascher *et al.* 2007). In these areas the species is rather abundant and widely distributed, whereas Switzerland is at the northern border of its geographical distribution. Accordingly, most of the Swiss specimens had been collected south of the Alps. *L. discum* is currently classified as an endangered species (Amiet *et al.* 2004).

CONCLUSIONS

We provide occurrence data on five bee species that are very rare or even new to Switzerland. The two new species augment the total number of Swiss bee species (Apidae) to 612. Despite the same capture effort in Zürich and Lucerne we found these five species only in the urban areas of Lugano. In the light of this result we may have to dismiss the hypothesis that these species were formerly overlooked urban inhabitants. More likely, Lugano is a first Swiss stepping stone for a Mediterranean insect fauna adapted to hot and dry summers and mild winters. So far the insubric climate of Ticino had been too wet for many potential immigrants among the Mediterranean insects. Since the climate in cities is generally warmer and drier than that in the surroundings, the cities tend to be the first habitats to harbour immigrant thermophilous species. These species may eventually spread to areas outside of cities when climate warming provides suitable temperature regime. We consider wild bees in cities as an enrichment for urban biodiversity as well as for the surrounding region. We suggest that urban areas be managed in ways that maintain meadows which provide nectar and pollen, as well as microhabitats which offer nesting opportunities for wild bees.

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