Storage buildings and greenhouses as stepping stones for non-native potentially invasive spiders (Araneae) – a baseline study in Basel, Switzerland

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Abstract. Transportation of goods via land, sea or air causes a dissemination of species on a global scale. In central Europe species that are associated with fruit, vegetables and/or buildings are suspected to be imported and potentially build up populations in the following four categories of buildings: I) greenhouses, garden centres, flower shops and flower wholesale stores, II) storage buildings and logistic centres, III) botanical gardens and zoos and IV) touristic hotspots. During this research 20 such localities in and around Basel were investigated by means of visual searching. 340 adult spider individuals were collected, representing 37 species and 15 families. Three were first records for Switzerland. Eight species were not published before for the region of Basel even if six of these were already known in private, not published collections – partly going back to the 1930s. Our investigation shows that the interpretation of the spread and invasion of species needs good published knowledge about the actual status of our fauna which, especially for synanthropic spiders, is not the case. We therefore urge everybody to publish all knowledge about faunistics even for so-called common species.

Keywords: faunistics, species introduction, new records

Zusammenfassung. Lagerhäuser und Gewächshäuser als Trittsteine für potenziell invasive nicht-einheimische Spinnen (Araneae) – eine Bestandsaufnahme in Basel, Schweiz. Gütertransport auf dem See-, Land- oder Luftweg verursacht die Verschleppung von Arten in einem globalen Rahmen. In Mitteleuropa können vor allem Arten, welche mit Früchten, Gemüse und/oder Gebäuden assoziiert sind, importiert werden und eventuell in den folgenden vier Kategorien von Gebäuden dauerhafte Populationen ausbilden: I) Gewächshäuser, Gartencenter und Blumenhandelsketten, II) Lagerhäuser und Logistikhäuser, III) Warmhäuser in Zoos und botanischen Gärten und IV) touristische Knotenpunkte. An 20 solchen Orten in und um Basel wurden Spinnen mit Sichtfang gesammelt. 340 adulte Spinnen verteilt auf 37 Arten aus 15 Familien wurden gefangen. Drei Arten waren Erstnachweise für die Schweiz. Acht Arten wurden erstmals für die Region Basel gemeldet, wobei sechs davon schon aus Privatsammlungen bekannt, aber nicht publiziert waren - teilweise bereits aus den Dreissigerjahren des letzten Jahrhunderts. Unsere Untersuchung zeigt, dass für die Interpretation von Invasion oder Ausbreitung von Arten gute faunistische Kenntnisse unabdingbar wären, die aber speziell für synanthrope Arten fehlen. Wir empfehlen daher dringend alle faunistischen Daten, auch zu sogenannten trivialen Arten zu publizieren.

The collection of the Natural History Museum of Basel (NMB) houses many alien spiders that originate from transport of vegetables and especially of fruit. Not only the well-known „Banana spider" *Heteropoda venatoria* (Linnaeus, 1767), but a further 13 alien spider species are documented in the NMB. Most of these spiders were found in the last century in cold storage houses and at least some of them were already dead upon arrival. Other sources for alien spiders are botanical gardens. Already Holzapfel (1932) recorded *Mermessus maculatus* (Banks, 1892) (sub *Eperigone m.*) and *Hasarius adansoni* (Audouin, 1826) from the Botanical garden in Bern. A similar investigation has been done in, e.g., the Humid Tropic Biome at the Eden Project in Cornwall (UK) by Smithers et al. (2004), where six alien species of spiders have been found. One reason for finding alien species in botanical gardens is certainly the exchange of plants including potting soil between the gardens. For Switzerland Hänggi (2003) discussed further records of alien spider species in Swiss hothouses or similar buildings.

International trade is increasing more and more. Transportation of goods on a global scale is a daily business. All this supports the transport of alien species around the world (Kobelt & Nentwig 2008, Nentwig 2015). In the database DAISIE (www.europe-aliens.org) lots of alien spider species are documented for every European country (Nentwig & Kobelt 2010, Roy et al. 2011). As an example, in the last five years the "Arachnologische Mitteilungen" published 10 papers dealing with alien spiders, many in warm houses or among fruit in food stores. Some of these are rather singular findings (Jäger 2009, Kielhorn & Rödel 2011) others seem to have established durable populations (Jäger 1998, Vanuytven 2004).

But what do we really know about the mechanism of the entering or what impacts these new species have in the new environment? Hänggi & Zürcher (2013) showed that the spreading of the southern spider *Zoropsis spinimana* (Dufour, 1820) occurred very fast. Only about 20 years after the first record north of the Alps the species spread everywhere in the surroundings of Basel and today is present in nearly all cities of Switzerland. Even if this species is not an alien species in the strict sense as defined in Nentwig (2015), it is obviously a non-native species for Europe north of the Alps. It indicates that at least some non-native species may spread with human activity (being introduced), are able to build up new populations (establish) and then potentially have an impact on other species (becoming invasive). While we do not know what the impact of these 'new' species really is, we should at least know which species are here.

One of the most problematic points in this context is data deficiency. We always depend on what is published, but is this published dataset the reality? Certainly not, as may be shown with the example of the spider *Brigittea* (= *Dictyna*) *civica*. Everybody working with spiders in Central Europe knows very well that this species occurs in very high numbers in every city in southern Central Europe since the middle of the last century. But Maurer & Hänggi (1990) cited only four records for Switzerland: one from Tessin, two from Lake Geneva and one from Wallis; and none from Basel where Schenkel collected the species at least in 1937, 1947 and 1950 (collection NMB). In the past 10 years, there were several investigations on spiders in Basel (Brenneisen & Hänggi 2006, Gloor et al. 2008, Altherr 2007) but none of these recorded *B. civica*. A similar situation can be found in Germany (Wiehle 1953, Staudt 2015).

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All these aspects show that there is a need for more published data, especially for so-called trivial species. Only if we know what is here, or was here at a defined time, will it be possible to make any interpretations about the potential spreading of non-native species. The aim of this paper is to present the dataset of a collection in Basel, Switzerland. Twenty localities in and around Basel with a high potential of housing alien spiders were examined. The data include three first records for Switzerland and seven species not yet published for the surroundings of Basel.

Methods

20 localities in and around Basel were investigated (Tab. 1). All these localities have a high potential for non-native spider species. They are categorised in four groups:

I) Greenhouses, Garden centres, flower shops and flower wholesale stores

It was supposed that greenhouses of nurseries would be the most important locality type. First, the high trade frequency supports the entry of alien spiders with flowers and potted plants. Then again, there is a high probability for the spiders to survive due to the consistent warm climate. We investigated six greenhouses, three flower shops, one garden centre and two flower wholesale stores.

II) Storage buildings and logistic centres

In this category the harbour buildings of Basel are included. The other two logistic centres are mainly specialized in flower and food logistics. One of them, Galliker Transporte, organises all fruit and vegetable imports for one of the biggest food sellers in Switzerland.

III) Botanical gardens and zoos

Botanical gardens, especially the hothouses, are of special interest. Here even species adapted to a tropical climate are able to survive. To know which species are living there is certainly important, even if it is not to be expected that these species will spread out of the hothouses. In the zoos alien species may be imported by plants and/or by special food supplies for the animals. Three such special habitats were investigated.

IV) Touristic hotspots

Jäger (1995, 2011) and Brenneisen & Hänggi (2006) published records of non-native spider species at train stations or along highways (Hänggi & Bolzern 2006). It is suggested that not only carriage of freight is a possible pathway of species, but it is also possible that spiders may come in with the luggage of tourists. Two such places were investigated. Unfortunately it was not possible to investigate the freight storage rooms at the airport due to administrative problems.

At every site spiders were collected by hand, without using traps. The length of time for collecting

Tab. 1: Investigated localities in and around Basel, Switzerland

Group	Loc Nr.	Locality Name	Address	Zip Code City	Coordinates (WGS84)	Altitude (m)	Notes
I	1	Flowershop Au Bouquet	Elisabethenstrasse 15	4051 Basel	N 47° 33' 10.65" E 7° 35' 30.52"	269	one room
I	2	Flowershop Denzeisen	St.Johanns-Vorstadt 60	4056 Basel	N 47° 33' 52.71" E 7° 35' 1.41"	249	one room
I	3	Flowershop Rheinblumen	Blumenrain 232	4051 Basel	N 47° 33' 40.23" E 7° 34' 22.49"	257	one room
I	4	Nursery Bürgerspital	Friedrich Miescher-Strasse 30	4012 Basel	N 47° 34' 20.88" E 7° 33' 41.88"	266	several rooms
I	5	Nursery Dobler	Lanjurtenstrasse 10	4132 Muttenz	N 47° 30' 43.46" E 7° 39' 30.62"	347	several rooms
I	6	Nursery LBB	Nonnenweg 68	4012 Basel	N 47° 33' 34.68" E 7° 34' 33.1"	271	several rooms
I	7	Nursery Meyer & Söhne	Allmendstrasse 160	4058 Basel	N 47° 33' 47.75" E 7° 37' 22.37"	261	several rooms
I	8	Nursery Peter Merian	Vorder Brüglingen 5	4052 Basel	N 47° 32' 17.34" E 7° 36' 50.31"	268	several rooms
I	9	Garden Center OBI	Reinacherstrasse 29	4053 Basel	N 47° 32' 26.53" E 7° 36' 12.61"	281	one spot
I	10	Flower wholesale Fleurametz	Reinacherstrasse 117	4053 Basel	N 47° 32' 13.44" E 7° 36' 16.59"	283	one room
I	11	Flower wholesale Regioflora AG	Schorenweg 10	4144 Arlesheim	N 47° 30' 20.21" E 7° 36' 45.67"	274	one room
I	12	Nursery City Basel	Unter Brüglingen 3a	4142 Münchenstein	N 47° 32' 3.93" E 7° 36' 54.23"	261	several rooms
II	13	Harbour Kleinhünningen	Westquaistrasse	4057 Basel	N 47° 34' 59.39" E 7° 35' 15.09"	248	one building
II	14	Galliker Transportation	Bäumlimattstrasse 7	4313 Möhlin	N 47° 34' 32.29" E 7° 51' 15.76"	294	one building
II	15	M&R Spedag	Kriegsackerstrasse 91	4132 Muttenz	N 47° 32' 5.69" E 7° 38' 5.81"	280	one room
III	16	Botanic Garden Basel	Schönbeinstrasse 6	4056 Basel	N 47° 33' 30.9" E 7° 34' 54.47"	269	several buildings
III	17	Zoo of Basel	Binningerstrasse 40	4011 Basel	N 47° 32' 51.41" E 7° 34' 46.09"	270	several buildings
III	18	Zoo Lange Erle	Hirzbrunnen	4058 Basel	N 47° 34' 27.59" E 7° 36' 30.5"	253	several buildings
IV	19	Railwaystation Basel SBB	Centralbahnhofstrasse 18	4051 Basel	N 47° 32' 48.36" E 7° 35' 20.94"	276	several rooms
IV	20	Railwaystation Badischer Bahnhof	Schwarzwaldstrasse 161	4059 Basel	N 47° 34' 5.33" E 7° 36' 23.11"	256	incl. data of student excursion (M. Monzel)

was not fixed and depended on the size of the building, but the minimum collecting time was two hours. Special emphasis was given to light sources, window frames, overhanging sills and undisturbed niches. All sites were visited between 19.12.2013 and 6.5.2014. Further data for the locality Badischer Bahnhof originate from a student excursion on 19.6.2013 guided by Markus Monzel, Biogeography, Dept. of Environmental Sciences, University of Basel. Not all detected spiders were caught when there were high numbers of individuals, but attempts were made to get all the different species. Therefore numbers of specimens are not strictly comparable between sites. Collected spiders were put in 75 % ethanol and determined in the laboratory.

For the determination the internet key "Araneae – spiders of Europe" (Nentwig et al. 2015) and a lot of specific literature was used. Only adult specimens were determined to species level. Nomenclature follows the World Spider Catalog (2015). Voucher specimens of every species are deposited in the collection of the Natural History Museum Basel.

Results

340 adult individuals (62 ♂♂, 278 ♀♀) were collected representing 37 species out of 15 families (Tab. 2). Theridiidae with eight species was the most frequent family, followed by Pholcidae and Salticidae with five species each and Agelenidae with four species. 15 species are not at all typically synanthropic spiders and were caught only as one or two individuals and always only at one site (marked with * in Tab. 2).

Even if collecting was not strictly standardised some differences in abundance and frequency are obvious. The most frequent species were *Pholcus phalangioides* (13 sites), *Parasteatoda tepidariorum* (12), *Steatoda triangulosa* (12), *Holocne-*

Tab. 2: Species list with ♂♂/♀♀ per locality. * in ns means: non synantropic species. Locality groups: I) greenhouses, garden centres, flower shops and flower wholesale stores; II) storage buildings and logistic centres; III) touristic hotspots; IV) botanical gardens and zoos

Species	ns	Locality																				Total
		Group I												II			III			IV		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Agelenidae																						
Eratigena atrica (C.L.Koch, 1843)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	.	0/1
Tegenaria domestica (Clerck, 1757)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/2	.	.	.	0/2
Tegenaria ferruginea (Panzer, 1804)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	0/1
Tegenaria hasperi Chyzer, 1897	*	.	.	.	.	0/1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1
Amaurobiidae																						
Amaurobius ferox (Walckenaer, 1830)	.	.	.	.	.	1/0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0
Araneidea																						
Larinioides sericatus (Clerck, 1757)	.	.	.	.	.	.	.	.	0/3	.	.	.	.	0/1	.	.	.	.	.	.	0/2	0/6
Zygiella x-notata (Clerck, 1757)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/2	.	.	.	0/2
Phrurolithidae																						
Phrurolithus festivus (C.L.Koch, 1835)	*	.	.	.	.	1/0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0
Dictynidae																						
Brigittea civica (Lucas, 1850)	.	.	.	.	.	.	.	.	.	.	1/2	.	.	0/1	.	.	.	.	.	.	0/1	1/4
Lathys humilis (Blackwall, 1855)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0	.	.	1/0
Gnaphosidae																						
Haplodrassus silvestris (Blackwall, 1833)	*	.	.	.	.	1/0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0
Trachyzelotes pedestris (C.L.Koch, 1837)	*	.	.	.	.	1/0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0
Linyphidae																						
Agyneta rurestris (C.L.Koch, 1836)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	.	.	0/1
Tenuiphantes tenuis (Blackwall, 1852)	*	.	.	.	.	.	.	.	1/1	.	.	.	.	.	.	.	.	.	.	.	.	1/1
Lycosidae																						
Pardosa hortensis (Thorell, 1872)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2/0	.	.	.	.	2/0
Miturgidae																						
Cheiracanthium mildei L.Koch, 1864	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	0/1
Oecobiidae																						
Oecobius navus Blackwall, 1859	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	3/4	.	.	0/1	3/5

Species	ns	Locality																				Total
		Group I												II			III			IV		
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Pholcidae																						
Holocnemus pluchei (Scopoli, 1763)	.	.	.	.	1/5	0/1	.	.	.	.	1/2	1/3	.	2/2	4/0	1/3	.	.	.	1/0	0/3	11/19
Pholcus opilionoides (Schrank, 1781)	.	.	.	.	.	.	.	.	0/1	.	.	.	.	.	.	.	.	.	.	.	.	0/1
Pholcus phalangioides (Fuesslin, 1775)	.	.	.	0/1	3/5	.	0/3	.	0/1	.	.	0/1	.	0/1	2/2	1/0	3/4	6/21	0/7	1/4	1/1	17/51
Psilochorus simoni (Berland, 1911)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	0/1	.	.	.	0/2
Spermophora senoculata (Dugès, 1836)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	.	0/1
Salticidae																						
Ballus chalybeius (Walckenaer, 1802)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0	1/0
Hasarius adansoni (Audouin, 1826)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/1	.	.	.	1/1
Heliophanus kochii Simon, 1868	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/0	1/0
Pseudeuophrys lanigera (Simon, 1871)	.	.	.	.	.	2/2	.	0/3	1/0	.	.	.	.	.	.	.	.	.	.	.	.	3/5
Salticus scenicus (Clerck, 1757)	.	.	.	.	.	.	.	.	1/0	.	.	.	.	.	.	.	.	.	.	.	.	1/0
Tetragnathidae																						
Metellina mengei (Blackwall, 1869)	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	.	0/1
Theridiidae																						
Coleosoma floridanum Banks, 1900	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1	.	.	.	.	0/1
Cryptachaea blattea (Urquhart, 1886)	.	.	.	.	2/0	.	0/1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2/1
Episinus truncatus Latreille, 1809	*	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	2/0	2/0
Parasteatoda tepidariorum (C.L.Koch, 1841)	.	.	.	0/1	0/1	2/11	0/1	0/1	0/1	.	.	1/0	.	.	.	1/0	.	1/7	0/4	0/1	1/4	6/32
Steatoda bipunctata (Linnaeus, 1758)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/4	0/1	.	.	0/5
Steatoda triangulosa (Walckenaer, 1802)	.	.	0/1	.	0/2	.	.	0/4	0/3	.	.	1/0	0/1	.	.	0/1	0/1	0/7	0/3	0/8	0/9	1/40
Theridion asopi Vanuytven, 2014	.	.	.	.	.	1/1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	1/1
Platnickina tincta (Walckenaer, 1802)	*	.	.	.	.	0/1	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	0/1
Uloboridae																						
Uloborus plumipes Lucas, 1846	.	0/2	0/5	.	.	0/10	0/5	0/19	.	0/2	.	.	1/21	.	.	.	1/22	1/5	.	.	.	3/91
Individuals																						62/278
Species		1	2	2	5	11	4	4	8	1	2	4	2	4	2	4	7	13	7	4	10	37

mus pluchei (9) and *Uloborus plumipes* (9). The same species were the most abundant ones with different densities in the different categories (Fig. 1). *U. plumipes* was by far the most abundant species.

The number of species per locality varies between one and thirteen (Tab. 2). The highest numbers were found in the Zoo Basel (13) followed by two nurseries (Dobler Gärtnerei (11) and Merian Gärten (8)) and then the Zoo Lange Erlen and the Botanical garden with seven species each. A special case is the Railway station Badischer Bahnhof with 10 species. But here the collecting effort was clearly higher than in the other localities because the catches of an excursion with several students are included. The lowest numbers, only one or two species, were found in flower shops and logistic storage buildings.

Faunistics

In Tab. 3 a compilation of the faunistically most interesting species is presented. Three species are first records for Switzerland. Two are genuinely new for Basel, while six are published for the first time for the region of Basel, but were known already. The status "confirmed" means that these two species were already found on one occasion earlier, but could be confirmed in this research.

First records for Switzerland

Oecobius navus Blackwall, 1859

Determination. Wunderlich (1995), Roberts (1998), Le Peru (2011), Shear (1970)

Distribution. Cosmopolitan. In temperate regions synanthropic, in warmer regions also known outside buildings (Nedvěd et al. 2011).

Remarks. *Oecobius navus* is the second species of *Oecobius* known in the region of Basel. While *Oecobius maculatus* Simon, 1870 was collected only once along a railway bank (Hänggi 2003, Brenneisen & Hänggi 2006), *O. navus* seems to be well established at least in the two localities Badischer Bahnhof and Zoo Basel. Especially in the house for birds in the Zoo there was a huge population (only a few were collected).

The first observation of this species in Basel was made during an excursion with students to the Badischer Bahnhof guided by Markus Monzel in 2013.

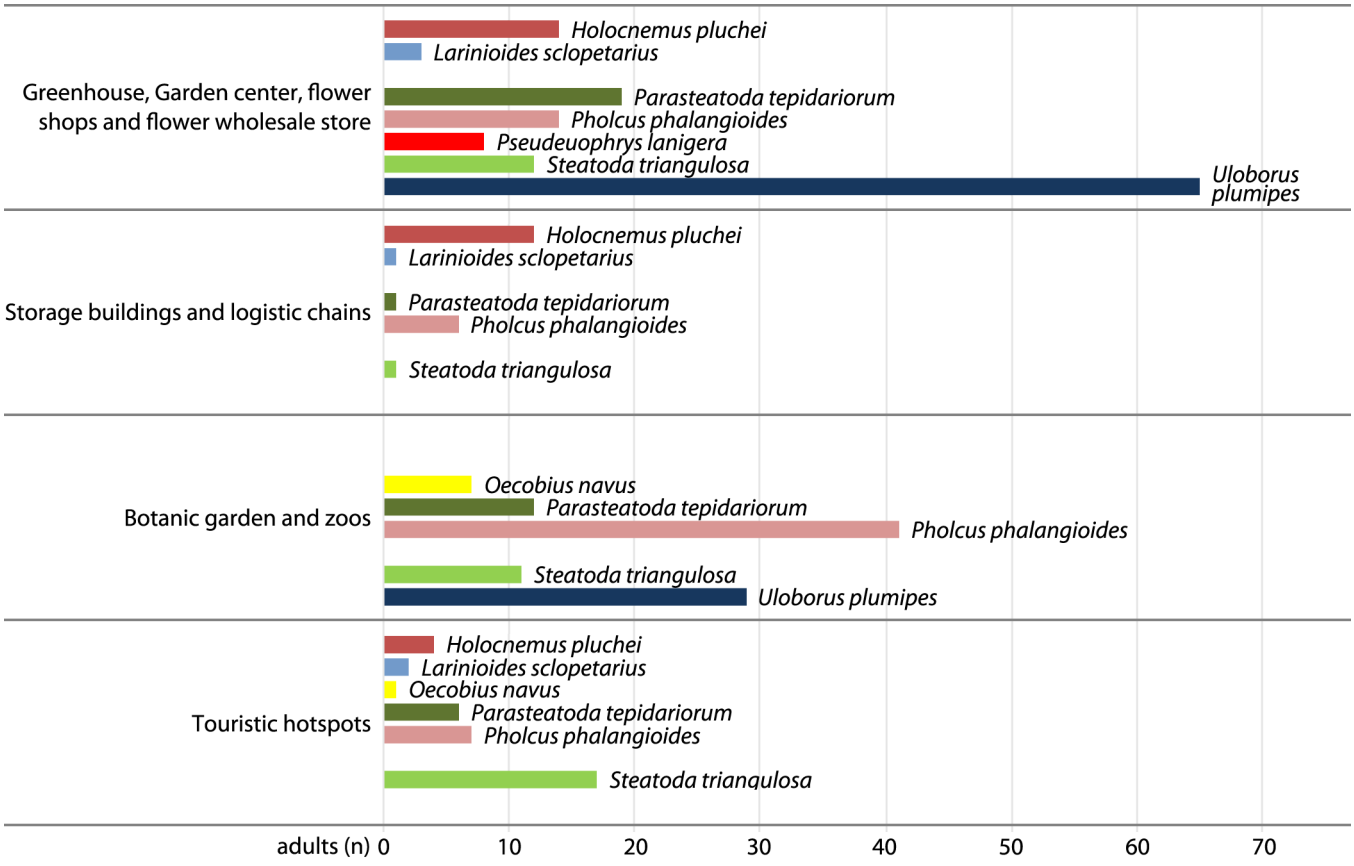

Fig. 1: Number of individuals for the most abundant species in the four groups of investigated localities

***Cryptachaea blattea* (Urquhart, 1886)**
Determination. Vink et al. (2009)
Distribution. Cosmopolitan. Vink et al. (2009) suppose an accidental anthropogenic dispersion.
Remarks. The species is already known from several European countries (e.g. Belgium: Vanuytven 2004, Germany: Sührig 2010, Great Britain: Marriott 2012) and most of the records concern agricultural or horticultural localities. Therefore it was not surprising to find the species in two nurseries in Basel. It may well be supposed that the species is to be found in more nurseries in Switzerland. Whether the species will be able to build up populations outside the nurseries in a temperate climate is not known.

***Theridion asopi* Vanuytven, 2014**
Determination. Vanuytven (2014), Roberts (1998)
Distribution. Switzerland (current findings), Belgium, France, Netherlands (Vanuytven 2014), Germany (Staudt 2015) and Italy (Pantini & Isaia 2015), mainly known from old quarries, rocks and walls of buildings.
Remarks. In contrast to the other two species *Theridion asopi* does not seem to be an alien species but rather represents a taxonomical problem. Until recently, the species was not separated from *Theridion mystaceum* L. Koch, 1870, *Theridion betteni* Wiehle, 1960 or *Theridion melanurum* Hahn, 1831.

Tab. 3: Faunistically most interesting species by groups: I) greenhouses, garden centres, flower shops and flower wholesale stores; II) storage buildings and logistic centres; III) touristic hotspots; IV) botanical gardens and zoos

Species	Status	I	II	III	IV
Coleosoma floridanum	confirmed for Basel	-	-	-	+
Cryptachaea blattea	new for Switzerland	+	-	-	-
Dictyna civica	first publication for Basel	+	+	+	-
Hasarius adansoni	confirmed for Basel	-	-	-	+
Holocnemus pluchei	first publication for Basel	+	+	+	-
Oecobius navus	new for Switzerland	-	-	+	+
Pholcus opilionoides	first publication for Basel	-	+	-	-
Psilochorus simoni	first publication for Basel	+	-	-	+
Steatoda triangulosa	first publication for Basel				
Spermophora senoculata	new for Basel	-	-	-	+
Tegenaria hasperi	new for Basel	+	-	-	-
Theridion asopi	new for Switzerland	+	-	-	-
Uloborus plumipes	first publication for Basel	+	-	-	+

New and confirmed for the region of Basel

Eight species are published for the first time for the region of Basel. Only two of these (*Tegenaria hasperi* and *Spemophora senoculata*) were not yet known from the Basel region. *T. hasperi* was recorded for the first time for Switzerland only a year ago from Tessin (Hänggi et al. 2014) and it may be supposed that it was imported accidentally. *S. senoculata* on the other hand is restricted to buildings in the northern countries of Europe and is a very tiny spider. Therefore it could be speculated that it was not recorded earlier because nobody collected (and published) in houses or it was just overlooked.

The other six species (*Brigittea civica*, *Steatoda triangulosa*, *Holocnemus pluchei*, *Pholcus opilionides*, *Psilochorus simoni*, *Uloborus plumipes*) were all already known in personal collections or represented in the collection of the NMB but were never formally published. Anyway, data of four of these species are entered in the Swiss database of the Centre Suisse de Cartographie de la Faune (CSCF 2015).

Coleosoma floridanum and *Hasarius adansoni* are recorded here for only the second time for the Basel region. The first was collected in 1999 in the botanical garden by B. Knoflach and published in Knoflach (1999) while the second was collected already on 4.10.1931 by E. Schenkel (collections of the NMB), but published only in Hänggi (2003).

The species *Uloborus plumipes*, Lucas 1846, is the most abundant spider. We found it in 12 of the 20 localities. One reason could be that the habitat requirements are good in most of the localities. Furthermore *U. plumipes* lives in the plants of nurseries, so with the transportation of plants, the spider spreads from one place to another (Reiche & Schmidt 1994). Remarkable is the colour variation of this species as illustrated in Fig. 2. At least for the females patterns from pure white to almost entirely black were found. Only four males were collected.

Discussion

The investigated localities were selected according to their potential for introduction of non-native spider species. The number of localities within the different categories varies. Even if no quantitative comparisons were intended some tendencies are obvious. So we can state, that in category I (greenhouses, garden centres, flower shops and flower wholesale stores) and IV (botanical gardens and zoos) the highest densities of spider individuals as well as the highest number of non-native spider species were observed. One explanation for the higher density in greenhouses of nurseries and in the zoological gardens could be the size of the localities and the higher diversity of habitats within the localities. It is clear that in a flower shop of 20 m^2 with daily cleaning there are not the

Fig. 2: *Uloborus plumipes* – colour patterns of females on the left, male on the top right and male palp on the bottom right

same ideal conditions for spiders as compared to greenhouses. In the zoological garden different buildings were investigated, which increases of the number of species.

In every category (I-VI) one species was caught in much higher numbers than the others and in every category it is a different species (Fig. 1). Even if collecting was not strictly standardised, the differences are so high that this result gives us room for interpretation of the particular habitat conditions. In category I the most abundant is *U. plumipes*, breeding in the hot and moist conditions of greenhouses. In the storage buildings and logistic centres (category II) *H. pluchei* is the most common species. This is a Mediterranean spider tolerating dusty, hostile conditions. *S. triangulosa* was the most obvious species in touristic hotspots (category IV) but was also found in 10 other localities. North of the Alps it is known as a synanthropic spider, reproducing well in and around buildings (Nentwig et al. 2015). According to these authors this species is known to have spread northwards in Europe since a few decades and was listed for Germany already by Wiehle (1937). In the collection of the NMB there is no record for Basel, even though it was familiar to E. Schenkel (record for Chiasso in Tessin, cited in Lessert 1910). In category III, botanical and zoological gardens *P. phalangioides* is the most frequent species.

There are 15 species that are by no means typical for synanthropic habitats (Tab. 2). All of these were found only as one or two individuals and always only in one locality. Twelve of these were found in greenhouses of nurseries, the botanical or zoological gardens. Such places have a high exchange with the surrounding nature. During the day windows and doors are often open and going in or out is quite easy not only for humans. The small number of collected specimens indicates that the species are only here by accident.

The data collection was done once per locality, during daytime. The collecting time depended on the size of the locality. Hand collecting is a usual method, but has disadvantages. The risk of overlooking especially small spiders is rather high and the success of collecting depends largely on the person collecting. Night-active, non-web-building spiders certainly are underrepresented. Therefore we would expect additional species if more intense collecting were to be done.

The classification for the status "new for Switzerland", "new for Basel" or "confirmed for Basel" is based first on the spider catalogue of Maurer & Hänggi (1990), second on new publications since then and third on the database of the Centre Suisse de Cartographie de la Faune (CSCF 2014). We accepted the database of the CSCF even if it may be questionable whether online databases with changing and only partly traceable distribution data should be accepted as published data in a strict sense. But even then, the example of *B. civica* (Lucas, 1850) shows that a species can already be known at a place since decades, but has never been published one way or the other.

Apart from private collections there is one source of further information: museum collections. Unfortunately these very often are not (yet) published but by definition should be, and mostly are, accessible to every researcher. The fact, that in our investigation six species are published for the first time for the region of Basel even if they were known in private collections before, shows the importance of publishing such collections especially when discussing distributions and invasiveness of species.

Conclusion

This paper pursues two main goals. When we talk about non-native species, then we have to know what exactly exists already at a given place. Our quite small collection had two goals: First to just obtain an inventory of synanthropic spiders in the investigated localities. The second goal was to publish new and not yet published spider species. We could find three new records for Switzerland and eight new records for Basel. Even if some of these were known for a long time, but not published, this confirms that the entry of non-native species exists and perhaps occurs every day. Until now we do not know anything about potentially dangerous species, but it could be useful to keep an eye on places where the import of alien species is most suspected. And any information on such imported species should be published formally to become known to the scientific community.

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