

INSUFFICIENCY IN DISTRIBUTIONAL FAUNISTIC DATA IN SYNANTHROPIC SPIDERS: A CASE STUDY OF THE OCCURRENCE OF *BRIGITTEA CIVICA* (ARANEAE, DICTYNIDAE) IN SOUTH MORAVIA, CZECH REPUBLIC

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Abstract

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This study is focused on distribution of the spider *Brigittea civica* (Lucas, 1850). It is probably a non-native species in the Czech Republic, which occurs synanthropically in central European conditions. It is well adapted to coexistence with humans, and since there is no natural enemy, it may freely redistribute. The aim of this study was to supplement the knowledge of distribution of this species in South Moravia. The present occurrence data were recorded from a total of 92 towns and villages via observing typical cobwebs. In 86 cases, the incidence was observed, in only six cases, there was not found even a single cobweb of the spider. Based on our records, we can suggest that *B. civica* is much more common than was previously mapped and the presence of this species in the Czech Republic was underestimated.

Keywords: *Brigittea civica*, Araneae, thermophilic species, species expansion

INTRODUCTION

The spreading of different exotic and other non-native species is well studied topic. There are many studies focused on different invasive and expansive species of animals and plants (Keller *et al.*, 2011; Staska *et al.*, 2014; Hoofman *et al.*, 2006), cause their potential (socio)economic importance (Holmes *et al.*, 2009; Oreska and Aldridge, 2011). From that perspective, spiders belong among well studied groups (Nentwig and Kobelt, 2010; Nedvěd *et al.*, 2011). The common wall spider, *Brigittea civica* (Lucas, 1850) is not medically or really economically important, but is known to pollute the faces of buildings (Billaudelle 1957, Hertel 1968). This spider belongs to the family Dictynidae and was reclassified from the genus *Dictyna* recently (Marusik *et al.*, 2015; World Spider Catalogue, 2017). Females reach a size of 3–3.5 mm, males are smaller, 2.5–3 mm. Sexual dimorphism is not much evident in this case (Kostanjšek and Celestina, 2008). *B. civica* feed on different small flying insects (mainly Diptera) and

also flying ants, various types of small species of butterflies and aphids. However, in case of starving, they can feed even on such sized invertebrate like common housefly – *Musca domestica* Linnaeus, 1758, which is nearly three times bigger. Unusual social behaviour of this spider species is also remarkable, because different individuals are able to share one caught prey together without fighting each other (Billaudelle, 1957).

Typical feature of the presence of *B. civica* are characteristic circular cobwebs on buildings walls in central Europe (Samu *et al.*, 2002). The main factors affecting the occurrence of this spiders on the walls are temperature, humidity and a character of plaster (Billaudelle, 1957). Ten or more cobwebs or even a colony of networks of interconnected fibres per 1 m² is not an exception (Krumpálová, 2001). The size of webs is approximately 5 cm in diameter and the surface vary between 50–60 cm² (Kostanjšek and Celestina, 2008). The wall surface affects the size of cobwebs. Smooth surfaces of walls host relatively

larger cobwebs. The distance between particular cobwebs is 3–8 cm (Billaudelle, 1957).

B. civica is a thermophilic species with high susceptibility to frost. The spiders also do not like direct rain and wind (Billaudelle, 1957). The natural occurrence of *B. civica* is in the area of Mediterranean Sea, where optimal weather conditions are throughout the year, and *B. civica* lives here mainly on rocks. In central European conditions, however, it inhabits almost especially the walls of buildings. Occurrences in Budapest (Hungary) and the Hornojedlová dolina (Slovakia), are one of the few exceptions, where cobwebs have been discovered on some spruces in urban greenery (Samu *et al.*, 2002; Franc, 2002). According to Buchar and Růžička (2002), it occurs also in road ravines, fences and banks of watercourses or on bridge constructions. But generally, man-made buildings are suggestive of rocks and are comparable with natural conditions (Krumpálová, 2001). This is one of the main reasons why we encounter this spider in most cases just on the walls of houses. *B. civica* prefers wall plasters with a rough surface and cavities which correspond with size of this creature and it also serves as protection. Those cavities have often optimum inclination on the sides, thereby protecting *B. civica* against adverse weather conditions. Cavities are also useful in winter during low temperatures. During the hibernation, spiders can survive even severe frost. Populations of *B. civica* take refuge under ledges or roofs. They prefer also various corners of buildings or places under the eaves. During observations in Hungary, it was found that it prefers walls orientated toward to southeast, on the other hand, minimum occurrence was on walls oriented to the west. The status of the building towards objects in space, e.g. tree creating shadow, has not a significant effect on density of settlements. On the contrary, presence of the light source plays an important role, because it serves as attractant to insects, potential food source (Samu *et al.*, 2002).

The distribution of *B. civica* reaches to central Siberia and to central Asia (Buchar and Růžička, 2002). The spider was also found in North America, northern Africa (Lissner, 2011) and South Africa (Foord, 2014). *B. civica* is considered as Mediterranean species originates from northern Africa and the islands of the Atlantic Ocean. From this areal, it began to spread to the European hinterland. The first discovery was made by Lucas in France in 1850 (Samu *et al.*, 2002). Relatively comprehensive data on the occurrence are known from Germany, where the spiders expanded very fast in the warmer regions of Germany (Hertel, 1968; Lemke, 2008), while in Baden-Württemberg, the species was included in the Red List of Threatened Species at some time (Nährig and Harms, 2003). *B. civica* is known from Switzerland (Wittenberg *et al.*, 2006), Belgium (Van Keer *et al.*, 2010), Austria (Jäger, 1995), Slovenia (Kostanjšek and Celestina, 2008), Turkey (Marusik *et al.*, 2011), Serbia (Grbič and Savič,

2010) and the island of Malta (Dandria *et al.*, 2005). It occurs everywhere in central Europe except Poland (Kostanjšek and Celestina, 2008), but it is likely that it occurs also in Poland, even if only in its southernmost places (Krumpálová, 2001). In Slovakia, it was reported by Miller and Svatoň (1978), Krumpálová (2001) and Franc (2002). Besides the above mentioned countries, the occurrence of this spider was recorded also from Croatia, Greece, Italy, including Sicily, France, Macedonia, Netherlands, Portugal, including Madeira, Romania, Spain, Ukraine (Helsdingen, 2016; Nentwig *et al.*, 2017). Presence in the Czech Republic is also noticed by Havlová and Hula (2010).

The first confirmed occurrence in the Czech Republic dates from 1982. The cobwebs were seen on the walls of the historic Wallenstein Gardens in the centre of Prague (Buchar and Kubcová, 2002). Currently, it is a relatively widespread species in the country, although, according to official data of Czech Arachnological Society (2016), *B. civica* occupied 7 faunistic squares only. Havlová (2008) brings another three faunistic squares in northern Bohemia. Macek (2006) recorded species in one faunistic square in the East of Bohemia. Bryja *et al.* (2005) states the occurrence of this species in southern Moravia. Specifically, in Mikulov, Bulhary, Lednice and natural sites Skalky and Pastvisko (so far the only natural places in the Czech Republic, where this spider was observed).

We can found *B. civica* in different urban habitats in southern Moravia quite often, although its incidence was currently recorded only from few faunistic squares. The aim of this study was therefore to map the actual distribution of *B. civica* throughout the South Moravian region.

MATERIALS AND METHODS

The South Moravian Region is made up of seven districts: Hodonín, Břeclav, Znojmo, Brno-venkov, Brno-město, Vyškov and Blansko. The southern border of the region demarcates with that of Austria and Slovakia. In the Czech Republic, it borders with the Vysočina Region, Southern Bohemia and regions Pardubice, Olomouc and Zlín (Czech Statistical Office, 2016).

Natural conditions of the South Moravian Region are diverse. The highest altitude in the region is located in the Hodonín district in the border triangle with the Zlín region and Slovakia, which is close to the dimensions of Durda (altitude 842 m.). The lowest point is located in the district of Břeclav. It is the confluence of the rivers Morava and Thaya (altitude 150 m a. s. l.) (Czech Statistical Office, 2016). In the South Moravian region, annual rainfall totals are relatively low, reaching 543 mm in accordance with a long-term precipitation normal. The region is one of the warmer areas of our country. The average annual temperatures rise up to 8.3°C (Czech hydrometeorological Institute, 2016).

Observations were conducted during the seasons of 2012 and 2016, using the same method in all cases. We proceeded from the edges of towns and villages to their centres and recorded the findings into a pre-prepared form. The presence of cobwebs was recorded via mentioned scheme. We did not record the real presence of spider individuals; we assume that presence of its web means the presence of the species. There were just two options within the recording of the species in region – presence (present) or absence (absent) of the cobweb on building. There were all municipalities with a permanent settlement mapped to avoid skewing of results. Drawings of occurrences into particular faunistic squares on maps were done according to Pruner and Mika (1996). For creation of the map, we used the free applications of BioLib (2016).

RESULTS

Before this study, the *B. civica* was recorded from only two faunistic squares within the South Moravian region. The mapping showed that, outside these two well-known cases, it is located also in other 50 faunistic squares evenly distributed throughout the South Moravian region.

All particular records following faunistic squares:

Faunistic square 7062:
Hluboké Mašůvky (22. 4. 2012) – present

Faunistic square 6664:
Tišnov (6. 5. 2012) – present;
Předklášteří (6. 5. 2012) – present

Faunistic square 6764:
Veverská Bítýška (3. 10. 2012) – present;
Chudčice (3. 10. 2012) – present;
Moravské Knínice (3. 10. 2012) – present;
Ostrovačice (16. 10. 2012) – present

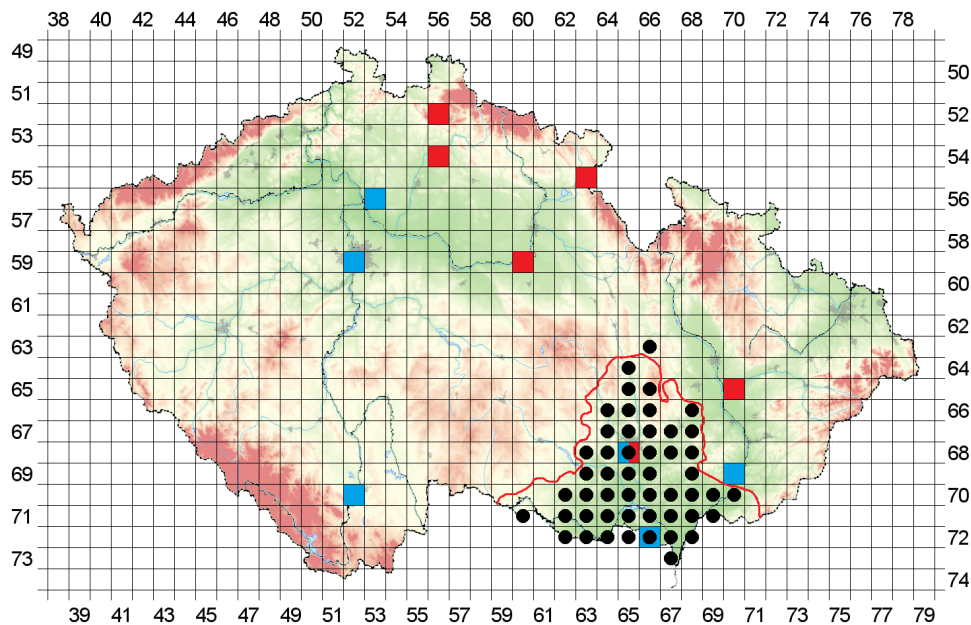
Faunistic square 6765:
Rozdrojovice (3. 10. 2012) – present;
Jinačovice (3. 10. 2012) – present;
Moravské Knínice (3. 10. 2012) – present;
Kuřim (3. 10. 2012) – present

Faunistic square 7163:
Lechovice (26. 5. 2012) – present;
Božice (27. 5. 2012) – present

Faunistic square 7162:
Hodonice (27. 5. 2016) – present;
Znojmo (18. 7. 2012) – present

Faunistic square 7164:
Novosedly (27. 5. 2012) – present;
Hrušovany nad Jevišovkou (18. 7. 2012) – present

Faunistic square 7165:
Mikulov (27. 5. 2012) – present



1: Map of occurrence of *B. civica* with faunistic squares (BioLib, 2013)

Red line indicates the area of interest (South Moravian region) where the observation was performed. Black dots represent incidence of *B. civica* recorded during the research in the faunistic square. Squares with no occurrence recorded remain without padding. Blue square indicates the incidence recorded in the years 1951 - 2000. Next, red square indicates findings from the years 2001–2015 (based on data of Czech Arachnological Society).

- Faunistic square 6965:
 Holasice (7. 6. 2012) – present;
 Rajhrad (7. 6. 2012) – present;
 Vojkovice (7. 6. 2012) – present;
 Židlochovice (3. 9. 2012) – present;
 Blučina (23. 6. 2012) – present;
 Nosislav (12. 9. 2012) – present;
 Hrušovany u Brna (12. 9. 2012) – present
- Faunistic square 6966:
 Nosislav (12. 9. 2012) – present;
 Moutnice (3. 9. 2012) – present;
 Žatčany (23. 6. 2012) – present
- Faunistic square 6865:
 Modřice (7. 6. 2012) – present
- Faunistic square 6867:
 Bučovice (20. 6. 2012) – present;
 Slavkov u Brna (7. 6. 2012) – present
- Faunistic square 6868:
 Bučovice (20. 6. 2012) – present;
 Nesovice (20. 6. 2012) – present
- Faunistic square 7267:
 Břeclav (15. 7. 2012) – present;
- Faunistic square 7168:
 Hodonín (15. 7. 2012) – present
- Faunistic square 7166:
 Lednice (15. 7. 2012) – present, Milovice
 (15. 7. 2012) – present,
- Faunistic square 7266:
 Lednice (15. 7. 2012) – present
- Faunistic square 7065:
 Vranovice (15. 7. 2012) – present;
 Příbice (15. 7. 2012) – present;
 Pohořelice (19. 8. 2012) – present
- Faunistic square 7064:
 Vlasatice (18. 7. 2012) – present;
 Troskotovice (18. 7. 2012) – absent;
 Našiměřice (19. 8. 2012) – absent;
 Olbramovice (19. 8. 2012) – present;
 Branišovice (19. 8. 2012) – present;
 Suchohrdly (19. 8. 2012) – present;
- Faunistic square 7070:
 Veselí nad Moravou (3. 8. 2012) – present;
- Faunistic square 7067:
 Kobyly (3. 8. 2012) – present;
 Čejč (3. 8. 2012) – present
- Faunistic square 7263:
 Slup (18. 7. 2012) – present;
 Jaroslavice (18. 7. 2012) – present;
 Hrádek (18. 7. 2012) – absent;
 Dyjákovice (18. 7. 2012) – absent
- Faunistic square 7264:
 Hevlín (18. 7. 2012) – present;
 Hrabětice (18. 7. 2012) – absent
- Faunistic square 7069:
 Bzenec (3. 8. 2012) – present
- Faunistic square 6968:
 Kyjov (3. 8. 2012) – present
- Faunistic square 7063:
 Miroslav (19. 8. 2012) – present;
 Hostěradice (19. 8. 2012) – present;
 Prosiměřice (19. 8. 2012) – present;
 Vitonice (19. 8. 2012) – present
- Faunistic square 7066:
 Velké Němčice (12. 9. 2012) – present;
 Hustopeče (12. 9. 2012) – present
- Faunistic square 6866:
 Šlapanice (23. 9. 2012) – present;
 Prace (23. 9. 2012) – present;
 Kobylnice (23. 9. 2012) – present;
 Sokolnice (23. 9. 2012) – present;
 Jiřice u Miroslavi (18. 7. 2012) – absent
- Faunistic square 6665:
 Kuřim (3. 10. 2012) – present
- Faunistic square 6864:
 Ivančice (16. 10. 2012) – present;
 Rosice (16. 10. 2012) – present;
 Oslavany (16. 10. 2012) – present
- Faunistic square 6863:
 Oslavany (16. 10. 2012) – present;
 Neslovice (16. 10. 2012) – present
- Faunistic square 6963:
 Moravský Krumlov (16. 10. 2012) – present;
 Vémyslice (23. 6. 2016) – present
- Faunistic square 6964:
 Dolní Kounice (16. 10. 2012) – present;
 Němčičky (23. 6. 2012) – present;
 Pravlov (23. 6. 2012) – present
- Faunistic square 7068:
 Dubňany (20. 5. 2016) – present
- Faunistic square 7367:
 Lanžhot (10. 5. 2016) – present
- Faunistic square 7265:
 Mikulov (27. 5. 2016) – present
- Faunistic square 7167:
 Podivín (14. 5. 2016) – present
- Faunistic square 7268:
 Moravská Nová Ves (12. 6. 2016) – present
- Faunistic square 7169:
 Strážnice (12. 6. 2016) – present
- Faunistic square 6766:
 Adamov (12. 6. 2016) – present
- Faunistic square 6565:
 Rájec-Jestřebí (12. 6. 2016) – present
- Faunistic square 7160:
 Vranov nad Dyjí (21. 6. 2016) – present
- Faunistic square 6767:
 Rousínov (12. 7. 2016) – present
- Faunistic square 6768:
 Vyškov (12. 7. 2016) – present

Faunistic square 6465:
 Letovice (10. 8. 2016) – present;
 Kunštát (24. 6. 2016) – present

Faunistic square 6668:
 Ivanovice na Hané (25. 6. 2016) – present

Faunistic square 6666:
 Jedovnice (24. 6. 2016) – present

Faunistic square 6366:
 Velké Opatovice (24. 6. 2016) – present

Faunistic square 6566:
 Sloup (24. 6. 2016) – present;
 Boskovice (24. 6. 2016) – present

Faunistic square 7262:
 Chvalovice (22. 6. 2016) – present

Overall, 92 towns and villages were visited. *B. civica* was observed in 86 settlements (93.5%). From these results, a net map of occurrence of *B. civica* in the South Moravia region was created (Fig. 1).

DISCUSSION

Spider *B. civica* was known from the territory of South Moravian region before, but the presence was really underestimated. Few records were published only by Buchar and Růžička (2002) and later by Bryja *et al.* (2005). Generally, based on the mentioned publication, the species was listed as scarce and was recorded from only four faunistic squares in Moravia. Actual occurrence map presented by the Czech Arachnological Society (2016) gives seven faunistic squares. Additionally, Havlová (2008) mentioned another three faunistic squares in northern Bohemia and Macek (2006) one faunistic square in the East of Bohemia. From our observations, we can confirm the spreading of the species into more faunistic squares than eleven currently published, of only two of them are located in the South Moravian region. One could thus say that we can meet this spider throughout the whole South Moravian Region. This discrepancy between our observations and the map published by the Czech Arachnological Society (2016) can be explained that both arachnologists and general public, whose dwellings the spider is often located in, are not interested enough in this spider or in synanthropic spiders in general. Perhaps this is why the species has still escaped throughout increased awareness until today. By contrast, in Germany, attention is paid to occurrence of this spider much more. The first major mapping was carried out already in the fifties, and subsequently, at the beginning of the 21st century (Lemke, 2008). On the other hand, Nentwig *et al.* (2017) mentioned that the species as “Rarely found“, again supporting the lack of interest of arachnologists to look on synanthropic spiders.

However, *B. civica* is not the only one expansive species in our country, which is probably expanding its distribution area in recent decades. One such species is e.g. *Cheiracanthium punctorium* (Villers,

1789), which has, contrary to *B. civica*, increased attention (cf. Kůrka & Dolejš, 2011). It is both because of its typical aposematic colouration and mainly because it can bite humans, resulting in unpleasant pain and, in some cases, more serious complications. The first confirmed record of this spider in our country comes from 1991 from Hrabanov in Lysá nad Labem. During the 90s it began to expand further into suitable areas (Košulič *et al.*, 2013). Nowadays, it is already located in at least 28 faunistic squares (Dolanský, 2011). According to Dolanský (2011) and our personal experiences, the recently spreading relative species *Cheiracanthium mildei* L. Koch, 1864 is also not studied well, also probably due its synanthropic occurrence in the Czech Republic.

There are several other studies dealing with the increasing number of spiders spreading from the South, e.g. *Argiope bruennichi* (Scopoli, 1172) or *Lycosa singoriensis* (Laxmann, 1770) (Košulič *et al.*, 2013; Krehenwinkel and Tautz 2013; Řezáč *et al.*, 2008), but synanthropic spiders are not well studied. There are several studies dealing with medically important tropical species like *Loxosceles* spp. (Hängi and Stäubli, 2012), *Phoneutria* spp. (Pospichil, 2014) or *Latrodectus* spp. (Van Keer, 2010; Rozwałka *et al.*, 2013), and also with some species occurring in greenhouses (Kielhorn, 2008), but occurrence of spiders which are just spreading across our border is just underestimated. Of course that the first records are always recorded (e.g. Rozwałka and Stachowicz, 2011; Hänggi and Bolzern, 2006) but the general occurrence after such findings are scattered and usually not observed regularly. In the case of *B. civica*, mapping is pretty simple due the presence of the cobwebs, which are even visible via Internet street views or official pictures of different municipalities. This is not a case of other species which are usually hidden and they have no such visible features. But based of our study, we can suggest that some common thermophilous synanthropic species (e.g. *Steatoda triangulosa* (Walckenaer, 1802), *S. grossa* (C. L. Koch, 1838), *C. mildei*, *Scytodes thoracica* (Latreille, 1882), *Pholcus phalangoides* (Fuesslin, 1775), *Parasteatoda tepidariorum* (C. L. Koch, 1841) and others.

CONCLUSION

Our study deals with present distribution of a spreading spider *B. civica* in the South Moravian region. Until now, the spider was recorded only in few faunistic squares throughout the region. However, we proved that this species occurs almost across the South Moravian Region. The research on distribution of *B. civica* is, however, still far from being final and the spider will continue to expand to places where it is still completely missing. Yet unanswered question remains; where the expansion of this species will stop when people overlook its presence and in turn they are still creating favourable conditions for its further expansion? It would therefore be appropriate to begin to address this issue at a higher rate than it is currently done. This spider surely deserves at least as much attention as it is given to another expansive species.

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