Long-term field study on mosquitoes in Austria, in particular the invasive Korean bush-mosquito *Aedes* (*Finlaya*) *koreicus* (Edwards, 1917). Langzeit-Freilanduntersuchung an Stechmücken in Österreich mit besonderer Berücksichtigung der invasiven Koreanischen Buschmücke, *Aedes* (*Finlaya*) *koreicus* (Edwards, 1917) in Österreich.

In 2011, the Austrian Agency of Health and Food Safety (AGES) launched a long-term project on West Nile virus (WNV) and further mosquito-borne pathogens surveillance based on mosquito vector monitoring. The documentation of invasive species has become a second interest of the agency since several new mosquitoes, three of which were of East Asian origin, could be documented in the country right at the beginning of the project. These species are obviously a concern of the national agency for the reason of their transmission-competence of severe pathogens such as Usutu (USUV), West Nile (WNV), Chickungunya (CHIKV) or, putative in future, Yellow Fever (YFV) Virus (ECDC 2012). The results (captured specimens, determined mosquito species, namely confirmed pathogens of entire Austria) are steadily reported on a "Mosquito monitoring map" of the AGES that is yearly published on the internet (Hufnagl et al. 2011–2019).

The Asian bush mosquito, *Aedes* (*Huleocoeteomyia*) *japonicus japonicus* (Theobald, 1901) was first caught in southern Styria on 9 August 2011 (Großklein: Kreuzbergwarte, N 46.42537°, E 15.27691°) (Seidel et al. 2012). After the first evidence of this species, a rather widespread population was found in the federal state of Styria, which was going to expand. Currently, the species is established in most Austrian regions (Seidel et al. 2016a) and it reduces or even eliminates the endemic mosquito fauna. The long-term investigations documented an unlimited active dynamic of the species to expand its habitat. We observed its forward migration and a steady spread through the federal states of Styria and Carinthia leading to broad invasions into Hungary and Italy respectively within a few years (Seidel et al. 2016b).

Near the Hungarian and Slovenian border further evidence of another species from East Asia was found in 2012. *Aedes albopictus* (Skuse, 1895), recently classified as *Stegomyia albopicta* [sensu Reinert], with its trivial names "Asian tiger mosquito" and "forest day mosquito", was spotted in Jennersdorf (N 46.56151°, E 16.06295°; 245 m a.s.l.). The finding was located in front of the active dispersal course of the Asian bush mosquito (Seidel et al. 2015). In July *A. japonicus* was replacing *A. albopictus* in a massive interspecific encounter in the region. (Seidel et al. 2016a).

In western Austria 25 *A. albopictus* larvae were caught in Angath (North Tyrol; N 47.30228°, E 12.03545°; 495 m a.s.l.) on 15 September 2012, in about 2 km distance of a car resting station along the motorway A12 (Seidel et al. 2015). We found further evidence of the species in the surroundings of the city of Salzburg in 2019 and in southwestern Styria in 2020. An establishment of the Asian tiger mosquito during solely one season cannot be postulated because of the interspecific dominance of the Asian bush mosquito that seems to eradicate a reappearance by spawning success.

On 29 September 2012, further novel evidence of a culicid species was found in the Tyrol. Larvae of the Korean bush mosquito, *Aedes koreicus* (Edwards, 1917), were caught near the castle of Tratzberg in the Inn valley (N 47.37975°, E 11.73285°; 522 m a.s.l.). This species was not included in the common key literature and its identification required confirmation by Francis Schaffner from Switzerland. Since we could not repeat a finding for proof due to the late season in 2012, and also not in the subsequent years, the finding remained unpublished. On 1 May 2017, the species was again identified with nine well developed larvae along with two larvae of *A. japonicus* in a village near Hermagor (western Carinthia; N 46.61532°, E 13.35083°; 584 m a.s.l.) (Seidel et al. 2017). Three specimens of the sample are deposited in the Diptera collection of the Natural History Museum in Vienna. On the same day, in 12.2 km western distance from the first finding, two *A. koreicus* larvae were found along with two *Aedes* (*Ochlerotatus*) *geniculatus* (Olivier, 1791) and one *Culex* egg raft in Treßdorf (N 46.63937°, E 13.20134°; 619 m a.s.l.) (see Hufnagl et al. 2011–2019). Both samples were taken out of waterfilled car tires which are used for agricultural purposes.

From August to November 2017, the three "exotic" Asian species were used for the development of a Maldi-tof data base for systematic mosquito determination.

The finding of *A. koreicus* in 2017 was followed by an extremely dry season in 2018 that did not provide further evidence. On 15 October 2019, two larvae of *A. koreicus* were detected along with *Culex pipiens* s.l. and *A. japonicus*, once again in Treßdorf. Evidence of the prevalence of the species in the region was again documented with ovi-trapping methods by a team of Austrian colleagues (Fuehrer et al. 2020).

In Italy *A. koreicus* has been found to our knowledge near Laggio di Cadore (N 46.49925°, E 12.47748°) in about 55 km distance to the Austrian border and at Lorenzago di Cadore (N 46.48626°, E 12.46327°) which is about 106 km from the nearest *A. koreicus* site in the Hermagor district, measured along a traffic route. The actual distance might be even shorter. Therefore, we may assume an existing connection between the Italian and the Austrian population.

In July 2020, we found several larvae twice in Gamlitz (southern Styria). At a distance of about 50 km lies Skorba (near Ptuj, Slovenia), where we found evidence of the species in September 2020 in the course of a collaborative study between the Office of Health (Styrian state government) and the University of Maribor (Slovenia). The first record of the species in Slovenia is located in Lovrenc na Pohorju about 35 km away from Gamlitz (Kalan et al. 2017). In our samples, the Korean bush mosquito occurred several times along with the Asian bush mosquito, exclusively and without native species. Therefore, we conclude that the Korean bush mosquito starts to replace the local mosquito fauna and shows a characteristic behaviour of invasives along the southern border regions of Austria.

A comparable occurrence of *A. koreicus* to that in southern Styria was described from Pécs (southern Hungary), where a dense population can be assumed (Kuruzc et al. 2016). The recently detected first record of *A. koreicus* in Germany stands in contrast

to the Hungarian and Austrian data because of a missing established population in vicinity. Its appearance must have its origin in passive introduction (Werner et al. 2016) comparable to our finding of the species in the Inn valley in September 2012.

Acknowledgements

Francis Schaffner determined individuals of a sample as *Aedes koreicus* in 2012. Iris Schachner and Philipp Eckerl worked on Maldi-tof applications with *A. albopictus*, *A. japonicus* and *A. koreicus* in autumn 2017. Julia Klikovits improved the English of the manuscript. The study was funded by several institutions, namely by the Austrian Climate Research Programme (AGES delivered a report; ACRP7; KR14AC7K11954) and the offices of the federal governments of Styria, Salzburg, Vienna and Vorarlberg.

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