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Rapid Communication

First records of casual occurrences of Chinese windmill palm *Trachycarpus fortunei* (Hook.) H. Wendl. in Austria

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Abstract

I report here the first six casual records of the Chinese windmill palm *Trachycarpus fortunei* (Arecaceae, Magnoliopsida) in Austria (and eastern Central Europe). All records are located in cities and villages in the eastern warm lowlands, and in most cases, the escaped self-sown young specimens survived at least one winter. However, as all sites are located on horticulturally used public and private spaces, long-term survival was impossible. Given that the pronounced climate warming-trend of the last two decades in Central Europe will most likely continue, it is probable that *Trachycarpus fortunei* will become more frequent in Austria (and beyond), populations will become more long-lived, and natural habitats will likely be colonized.

Key words: alien flora, biological invasions, climate change, horticulture, laurophyllisation, urban habitats, vascular plants

Introduction

The numbers of alien species are increasing rapidly (Seebens et al. 2017), with trade (Seebens et al. 2015) and horticulture (Hulme et al. 2018; van Kleunen et al. 2018) being the most important drivers for plant invasions. In addition, other global change phenomena such as climate change (Seebens et al. 2015; Dullinger et al. 2017) foster the spread of alien species. In temperate regions such as Central Europe, the weakening of frost periods and temperature minima in winters have facilitated the spread of evergreen broadleaved shrubs and trees in recent decades – a phenomenon termed "laurophyllisation" (Walther et al. 2007, 2009). Here, I report and discuss the first records for Austria of a poster species of such laurophyllous species – i.e. the Chinese windmill palm (*Trachycarpus fortune* (Hook.) H. Wendl.) (Walther et al. 2007). This species has been spreading in parts of western and southern Europe in recent decades, but records from regions with harder climates in Europe have been absent so far.

Materials and methods

The alien plant vascular plant flora of Austria has been intensively monitored in recent decades. An inventory of alien plant species has been

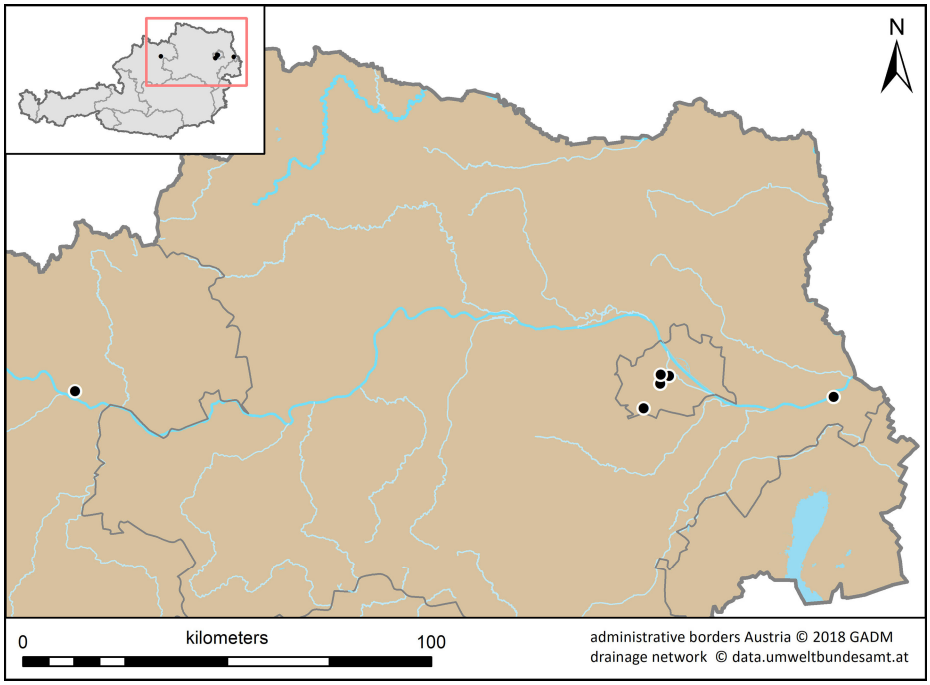

Figure 1. Locations of the six records of *Trachycarpus fortunei* in eastern Austria.

published in the early 21st century (Essl and Rabitsch 2002). Many records of new alien species have been recorded thereafter, and an update of the Austrian checklist of alien plant species is underway (Essl et al., *in prep.*). During non-systematic field work done in the last decade to record additions to the alien flora of the capital of Austria (Vienna), escaped seedlings of *Trachycarpus fortunei* have been found at several sites. For a comprehensive overview on ornamental use and to collect further indications of incipient spread of *Trachycarpus fortunei* in Austria, I have contacted > 20 colleagues working in horticulture, the public Botanical Gardens, and botanists recording alien plant species (see acknowledgements).

Results

Records

In total, three of my own records and another three records that have been communicated by colleagues, horticulturists and gardeners are reported here (Figure 1). On 15 December 2015, I found five seedlings of *Trachycarpus fortunei* below a tree in front of the building Klosterneuburger Strasse 21 in the 20th district (48°12′44.43″N; 16°22′05.03″E) (Figure 2). One of these plants survived the winter 2015/15 and was still alive in March 2016, but died in the weeks thereafter. On 23 October 2016 four young specimens were found in flower beds at the end of the railway track number 6 at the Westbahnhof (48°11′47.53″N; 16°20′14.37″E). These plants were weeded out a few weeks after. Finally, I recorded c. 20 seedlings which grew in a large flower pot in front of the building Hernalser Hauptstraße 9 in the 17th district on 22 December 2018 (48°12′59.62″N; 16°20′28.21″E). Until 6th March

Figure 2. Two young specimen of *Trachycarpus fortunei* in front of the building Klosterneuburger Strasse 21 in the 20th district in Vienna; 15th December 2015. Photograph by Franz Essl.

2019, c. eight of these plants had survived winter and still were alive. Interestingly, no adult specimens of *Trachycarpus fortunei* were present in the surroundings of these three escaped populations, so it remains unknown how propagules have been transported to the sites of the escaped populations.

While surveying, colleagues working in the ornamental sector in Vienna reported a fourth record of *Trachycarpus fortunei* from a compost heap in the garden of the house Tribulzgasse 7 in the 23rd district (48°08′44.34″N; 16°16′32.66″E) (Müller, *pers. comm.*). This so far unpublished record was made already in the Winter 1995/96, and is thus the first one for Austria. It consisted of c. 60 young plants that germinated on the compost heap after fruits of *Trachycarpus fortunei* that had been collected in the early 1960s had been discarded on the compost heap. Many of these seedlings survived the winter, and one of the palms had been transferred to a flower pot in the subsequent spring. This specimen has been planted into the garden in the year 2011 and is still alive. At none of these four locations were mature specimens of *Trachycarpus fortunei* present nearby. However, as the species is a popular ornamental plant which is often kept in transportable flower pots to be moved to sheltered places during winter, it cannot be excluded that adult plants that may have reproduced were present previously and might be the potential sources of propagules.

Two further records of *Trachycarpus fortunei* outside Vienna have been made in recent years. In Luftenberg in Upper Austria, young specimens have been recorded (48°16′26″N; 14°24′40″E) (Hillebrand, *pers. comm.*), while in Bad Deutsch-Altenburg in Lower Austria, young specimens have been recorded several times in gardens (48°08′01″N; 16°54′08″E) (Lackner, *pers. comm.*). At both locations, the escaped plants have been recorded in gardens close to planted specimens.

In addition, there are increasing reports of long-term survival of planted individuals of *Trachycarpus fortunei* in recent years from cities and villages in the lowlands of Austria, including the survival of planted young plants in Guntramsdorf in Lower Austria from 2011 to date (Watzer, *pers. comm.*).

Discussion

The six populations of *Trachycarpus fortunei* reported here consisted solely of young specimens. Some of these survived one or several winters. All populations of *Trachycarpus fortunei* were found in habitats that are typical for urban environments, i.e. public spaces used for ornamental plants, and in private public gardens. At these sites, long-term survival was impossible due to weeding and other horticultural activities. The majority of the recorded populations have been recorded in Vienna, which—due to the urban heat island effect—has the mildest climate of Austria (Berger and Ehrendorfer 2011). As a consequence of climate change, winter minimum temperatures have not fallen below −15.0 °C in the inner districts of Vienna from 2010 onwards (Stadt Wien 2019). The absence of strong frosts is known to promote the spread of *Trachycarpus fortunei* (Walther et al. 2007). In its native range in China, it has been shown that the Chinese windmill palm tolerates monthly minimum temperatures of the coldest month of c. +2.2 °C (Walther et al. 2007). Particularly relevant for winter survival are minimum temperatures. In European gardens, *Trachycarpus fortunei* can survive minimum temperatures of c. −14°C without frost damage (Winter 1976). Field experiments suggest that the interaction of low temperatures in winter and length of the growing season are important for limiting this species' northern/upper distribution when exposed to natural conditions (Walther 2003). Thus, winter temperatures in Vienna in recent years were suitable for the survival of *Trachycarpus fortunei*.

The Austrian populations reported here represent the first escaped occurrences of the Chinese windmill palm for Central and Eastern Europe. Accordingly, the species is missing from the alien vascular plant checklists of the Czech Republic (Pyšek et al. 2012) Slovakia (Medvecká et al. 2012), Hungary (Balogh et al. 2004; Kiraly, *pers. comm.*), and Poland (Mirek et al. 2002; Tokarska-Gudzik, *pers. comm.*). Similarly, although there has been intense recording of alien plant species in many parts of Austria including detailed inventories of the alien flora for large cities (e.g. Salzburg, Pilsl et al. 2008), the Chinese windmill palm has not been recorded previously. In western and southern Europe, where climates with mild winters prevail, *Trachycarpus fortunei* is substantially more widespread. For instance, it is widely established in Ticino in southern Switzerland (Walther et al. 2007) but has more recently also become regularly recorded and locally established in northern Switzerland (Infoflora 2019). Consequently, in Switzerland *Trachycarpus fortunei* is considered invasive, as it spreads

vigourously in thermophilic forests in the Ticino (NN 2019). In South Tyrol, *Trachycarpus fortunei* has become locally established in the warm Etsch-valley since the 1990s (Naturmuseum Südtirol 2019), although it is less abundant than in Ticino. In France, the Chinese windmill palm is reported as a casual alien species in urban environments (Tison and de Foucault 2014). For instance, escaped occurrences have been reported from Alsace in the Upper Rhine Valley (Neff 2007), where climatic conditions are similar to the ones prevailing in eastern Austria.

In cooler parts of northwestern Europe, the Chinese windmill palm is still rare. For instance, in Belgium, it was not listed in the "Catalogue of neophytes in Belgium" (Verloove 2006), only thereafter a few casual records of seedling were made (Verloove 2019). For the British Isles, few records of selfsown plants where known already in the 1990ies (Clement and Foster 1994).

The first short-lived occurrences of *Trachycarpus fortunei* add to a number of other laurophyllous shrubs and trees such as *Prunus laurocerasus* (Rusterholz et al. 2018), *Viburnum rhytidophyllum* (Kleinbauer et al. 2010; Wirth et al. 2015), and *Euonymus fortunei* (Adolphi and Kasperek 2004), which have become more frequently recorded in Austria and adjacent countries in recent years. These species are widely cultivated ornamentally in Austria (and in Central Europe in general), and incipient spread is typically confined to sites close to planted specimens (Essl et al. 2012). In latter invasion stages, laurophyllous species (incl. *Trachycarpus fortunei*) increasingly invade natural habitats such as forests as has been documented for Ticino in southern Switzerland (Walther et al. 2007).

I argue that given the pronounced climate warming-trend of the last two decades in Central Europe will most likely continue, it is likely that *Trachycarpus fortunei* in Austria (and beyond) will become more frequent, populations will become more long-lived, and more natural habitats will likely be colonized.

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