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Rapid Communication

First record of American skunk-cabbage *Lysichiton americanus* Hultén & H. St. John (Araceae) in Poland

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Abstract

Lysichiton americanus is a robust rhizomatous plant native to the Pacific part of North America. This species was introduced to Europe in Great Britain at the beginning of the 20th century and since then, due to its aesthetic value, it has been used as an ornamental plant in numerous European countries. Since then and after numerous introductions, established populations of this plant have been reported in 9 European countries. It was classified by the European Union as an invasive non-native plant species. The current study describes the first record of a wild-growing population of *L. americanus* in Poland. It was found in an overgrown former pond, neglected for about 50 years, near the rural park located in the Sudetes Mountains (south-west Poland). Apart from its distribution, its phytosociological affiliation and status in the Polish flora are also described.

Key words: alien flora, naturalization, rural park, vascular plants, Western Sudetes

Introduction

Most of the ornamental plants cultivated in gardens and parks are alien species. Therefore, those places become important places of naturalization of many exotic plants, as well as a source of expansion to neighboring ecosystems (Reichard and White 2001; Galera and Sudnik-Wójcikowska 2010; van Kleunen et al. 2018) and the closest vicinity of such places (i.e. gardens and parks) often becomes an area of occurrence of alien species. This is the case with the skunk-cabbage *Lysichiton americanus* Hultén & H. St. John (Araceae) which is here reported from a neglected and overgrown pond adjacent to a rural park in the southwest part of Poland. This plant is considered invasive to wetland habitats in many Western European countries (Klingenstein and Alberternst 2010). In 2016, it was classified by the European Union as an invasive non-native plant species (List of Invasive Alien Species of Union concern). So far in Poland, it was only known as

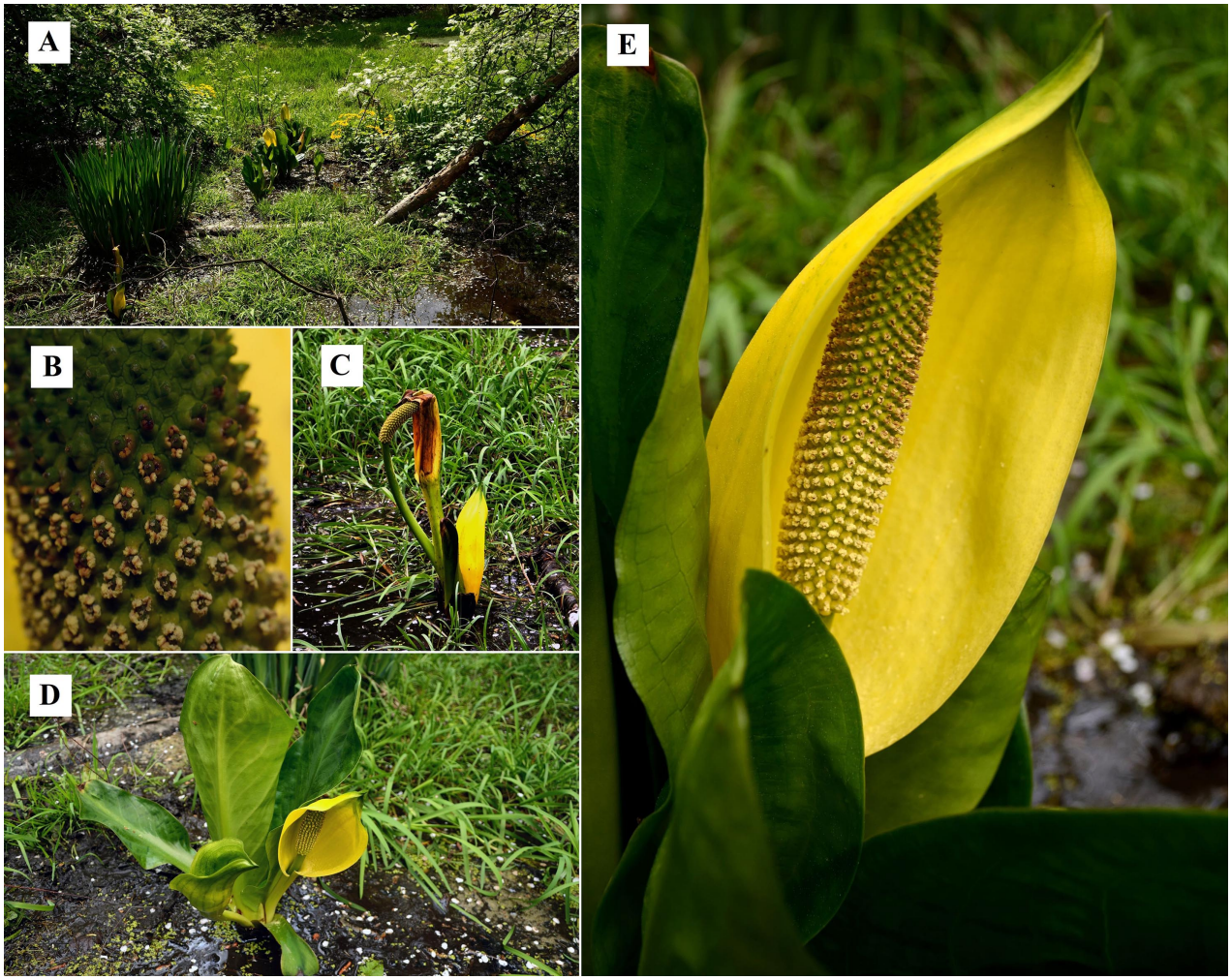

Figure 1. *Lysichiton americanus* in Janowice Wielkie, and its: habitat (A), inflorescence (B), deciduous spathe (C), habit (D) and spathe (E). Photographs by M. Bochynek.

cultivated in botanical gardens but it was included on the national list of potentially invasive plants (Tokarska-Guzik et al. 2012). The Polish Minister of the Environment (2011) placed *L. americanus* on the list of plants and animals of alien species that, if released into the natural environment, may pose a threat to native species or natural habitats. Here, we report and discuss the first records of *L. americanus* outside cultivation in Poland.

Materials and methods

Study species

Lysichiton americanus is a rhizomatous, robust plant that forms large clumps (Figure 1A, D); leaves are large and shortly petiolate with a shiny, medium green and entire leaf blade (up to 135 × 70 cm) with elliptic to oblong-ovate or oblanceolate shape, truncate to cuneate base and obtuse to acute apex (Figure 1D); scapes are shorter than leaves; erect and malodorous inflorescences are in the form of stout, stipitate and 3.5–12 cm long spadix which is wrapped round and concealed at the base by a yellow, boat-shaped, 10–35 cm long and deciduous (wilt after anthesis) spathe (Figure 1B, E);

yellowish-green and 4-tepals flowers are hermaphroditic with 4 stamens and (1-)2-locular ovary; green berries (each with 2 seeds) embedded in the white, pulpy axis of spadix form oblong-ovate infructescences (Tutin et al. 1980; Thompson 2000; Stace 2010).

American skunk-cabbage is native to the Pacific part of North America (from Alaska to California) (Thompson 2000; Klingenstein and Alberternst 2010; Stace 2010). This species grows especially in wet woodlands, swamps, fens, lakesides, ponds, along streams and riverbanks and other low-altitude wet areas (0–1400 m alt.) (Doyle and Duckett 1985; Thompson 2000; Anonymous 2006). First of all, it prefers deeply moist soils, but it can also grow in stagnant or flowing water, as well as in sandy and clay soils with a pH ranging from alkaline, to neutral and acidic (Anonymous 2006; Lebreton 2007).

Methods

The status of *L. americanus* in Poland was determined based on Tokarska-Guzik et al. (2012) and following the updated of the Alien Plants in Poland database (2022), managed by the Institute of Nature Conservation, Polish Academy of Sciences.

The field surveys were carried out in May 2020, June 2021 and May 2022 in Janowice Wielkie (Western Sudetes, south-west Poland). The species was identified by comparing its morphological characteristics with the data contained in the determination keys – Tutin et al. (1980), Thompson (2000) and Stace (2010). At the site where the species under study was found, a phytosociological relevé was conducted according to the Braun-Blanquet method (1964), recording the species composition of the plant community with *L. americanus*. The nomenclature of vascular plant taxa follows the Euro+Med PlantBase (Euro+Med 2022) and phytosociological names follow Mucina et al. (2016). The distribution map of American skunk-cabbage was made using QGIS 3.6.1 (QGIS Development Team 2019). Herbarium specimen is deposited at the Herbarium of the W. Szafer Institute of Botany of The Polish Academy of Sciences in Kraków (KRAM 646804).

Results

The established population of *L. americanus* is located in the southern part of the village of Janowice Wielkie (Karkonosze County, south-west Poland), at 401 m a.s.l. (coordinates: 50.8700616N; 15.9160717E) in the Rudawy Janowickie mountain range (Western Sudetes) (Figure 2).

The population of 32 individuals of *L. americanus* was observed near the rural park – about 50 m from the border, in a former pond that has not been used for about 50 years. Currently, the place is overgrown with boggy ecosystems – rush communities with fragments of willow thickets and a regenerating forest with the domination of alder. *Lysichiton americanus*

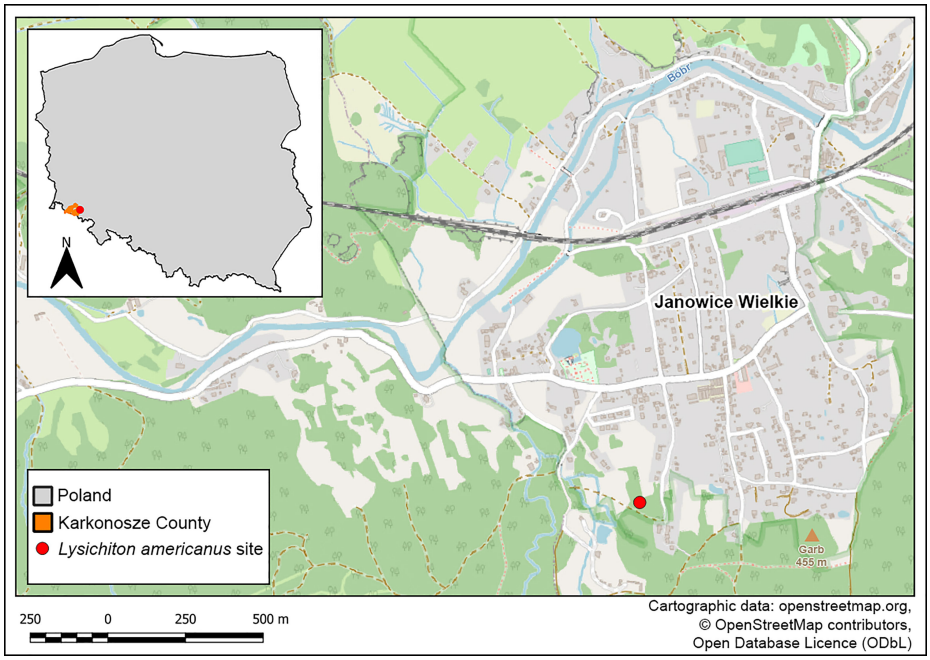

Figure 2. Location of the established population of *L. americanus* in Janowice Wielkie (Karkonosze County, Poland).

Table 1. Phytosociological relevé of vegetation with *L. americanus* Hultén & H. St. John.

No.	Species name	Abundance
1	*Prunus padus* L.	2
2	*Alnus incana* (L.) Moench	1
3	*Lysichiton americanus* Hultén & H. St. John	2
4	*Glyceria fluitans* (L.) R. Br.	2
5	*Iris pseudacorus* L.	2
6	*Lycopus europaeus* L.	2
7	*Acer pseudoplatanus* L.	+
8	*Caltha palustris* L.	1
9	*Cardamine amara* L.	1
10	*Fraxinus excelsior* L.	+
11	*Galium palustre* L.	+
12	*Geum urbanum* L.	+
13	*Poa trivialis* L.	+
14	*Prunus padus* L.	+
15	*Ranunculus repens* L.	1
16	*Urtica dioica* L.	+

individuals are scattered over an area of about 1000 m^2. At the time of observation in 2020 and 2021, all individuals bloomed profusely, but none of them set seeds. Vegetative reproduction is probably the only way of the species propagation in the observed area. Most of the specimens occur in a regenerating Ash-alder alluvial forest. Phytosociologically, these communities are classified into the alliance *Alnion incanae* (Mucina et al. 2016). The plant community was documented with a phytosociological relevé with an area of 50 m^2. The shrub layer is well-developed and covers 80%. It is dominated by *Prunus padus* L. and *Alnus incana* (L.) Moench. The herb layer (cover 70%) is dominated, except *Lysichiton americanus,* by *Glyceria fluitans* (L.) R. Br, *Lycopus europaeus* L. and *Iris pseudacorus* L. (Table 1).

All ponds in the nearby rural park were checked. No further populations of *L. americanus* have been found anywhere. Populations of this species may have been destroyed during pond renovation works carried out in recent decades in the park.

Discussion

This is the first record of *Lysichiton americanus* outside cultivation in Poland. The observed population is associated with a wetland habitat – a strongly marshy riparian forest.

In the countries of Western Europe, it occurs in similar habitats (Anonymous 2006). It is considered an invasive species there due to its potential to create large colonies that limit access to light for other plants, and thus affect the biodiversity of ecologically sensitive wetland habitats (Anonymous 2006). *Lysichiton americanus* was first introduced in Europe in Great Britain, where it was brought as an ornamental plant at the beginning of the 20th century (Tutin et al. 1980; Anonymous 2006). Since then, this species has been introduced in other European countries, mainly in botanical gardens, parks and home gardens (Fuchs et al. 2003; Klingenstein and Alberternst 2010). Currently, American skunk-cabbage is established in 9 European countries (Belgium, Denmark, Finland, Germany, Great Britain, Ireland, the Netherlands, Norway and Sweden) (Klingenstein and Alberternst 2010). In Poland, it was also first introduced to botanical gardens (Tokarska-Guzik et al. 2012). The studied population has been found outside the rural park but not in the park itself. It is possible that it existed in the park in the past, but it could have disappeared after renovation works were carried out on water reservoirs. Thus, the study population may be a remnant of a larger one as the water overgrown pond is connected with other ponds in the park.

Although *L. americanus* in the study area does not produce fruit and seeds capable of germinating, it creates stable populations. It reproduces vegetatively by rhizomes. In the future, climate change can help to fully naturalize the species (Haeuser et al. 2018; Adhikari et al. 2019). Therefore monitoring of the *Lisichiton americanus* population is planned.

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Authors' contribution

MB: investigation and data collection; AW: sample design and methodology, data analysis and interpretation, writing – original draft; MM: research conceptualization, data analysis and interpretation, ethics approval, funding provision, writing – review and editing.

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