

Data sheets on quarantine pests
Fiches informatives sur les organismes de quarantaine

Lysichiton americanus

Identity

Scientific Name: *Lysichiton americanus* Hultén & St John,
Taxonomic position: *Araceae*.

Common names: American skunk cabbage, yellow skunk cabbage (English), arum bananier, lysichite (French), skunk-kalla (Norwegian), gelbe Scheincalla, amerikanischer Riesenaronestab (German), gul skunkkalla (Swedish).

Notes on taxonomy and nomenclature: the name of this genus was given by Schott (1857), who used '*Lysichiton*' for the German description, but '*Lysichitum*' for the Latin description. '*Lysichiton*' is preferred.

EPPO code: LSYAM.

Phytosanitary categorization: EPPO A2 Action list no. 335.

Morphology

Plant type

L. americanus is a perennial, herbaceous plant that can be a geophyte or a hydrophyte.

Description

L. americanus is a robust plant which forms large clumps. The stock is a thick, fleshy rhizome (up to 30 cm long and with a diameter of 2.5–5 cm), below ground, but sometimes also partly above ground. Roots are white and contractile. The leaves are shortly petiolate and entire, ovate, cuneate to subtruncate at the base, the apex obtuse to acute, large (40–120 × 27–70 cm) and shaped like a tobacco leaf, leathery in texture, with a light sheen and with thick veins. Plants are generally erect, from relatively short to 1.5 m high. *L. americanus* develops one or two inflorescences per plant, with scape shorter than the leaves. The inflorescence is a showy bright yellow spathe (8–45 cm high), surrounding a fleshy spadix (8–25 cm) which bears small, green flowers. Flowers are yellowish green, generally many, often monoecious (pistillate below, staminate above), but sometimes also bisexual. The perianth segments are generally 4, sometimes 6, free or fused; tepals 4, stamens generally 0 or 4, sometimes 6, free or fused; ovaries (1-)2-locular; ovules 1–2, superior to half-inferior and sunken in inflorescence axis, chambers 1–3, stigma more or less sessile. The spadix is initially shorter than the spathe, eventually long

exerted through elongation of the stipe. After flowering, fruits (150–350 green berries) develop along the spadix. Each berry usually contains 2 (sometimes 1–4) grey-brown to red-brown seeds (5–11 mm).

Similarities to other species

L. camtschatcensis (Linnaeus) Schott, from northern Japan and Far-eastern Russia (Sakhalin, Kamchatka), is similar, but has a white spathe, the flowers are odourless, the spadix is usually smaller, and the perianth segments are on average smaller. The upper part of the perianth segments is more fleshy, stamens are more protruded and the anthers are considerably smaller. Habitats are comparable (Hultén & St. John, 1931). *L. camtschatcensis* is also in cultivation in Europe (Walters *et al.* 1984), but has not been reported to be invasive. Another North American species of the *Araceae*, *Symplocarpus foetidus* (Linnaeus) Nuttall, bears some outward resemblance to *L. americanus*. It has a similar fetid odour and the same habit of growth, and is also in cultivation in Europe (Rosendahl, 1911; Walters *et al.* 1984).

Biology and ecology

General

L. americanus is a terrestrial, semi-aquatic or aquatic herbaceous perennial plant. One adult plant may cover 1 m² ground. Growth is slow but *L. americanus* can build up old (more than 80 years) and dense populations. Inflorescences appear between March and May, emerging and flourishing before the leaves come out. Seeds mature in its native area of distribution from June to July, and in Germany in July or early August. Plants do not flower every year in their native range. Plants at shady sites and small plants are more likely to fail to flower (Willson & Hennon, 1997). The inflorescence has a distinctive unpleasant odour which is a combination of skunk, carrion and garlic. It acts as an initial attractant for beetles, flies and midges which respond by initiating search behaviour for yellow spathes. *L. americanus* is non-thermogenic. In its native area of distribution, *L. americanus* is pollinated by adults of *Pelecomalius testaceus* (Coleoptera: *Staphylinidae*), which feed on the pollen and use the inflorescences as a mating site (Pellmyr & Patt, 1986). Seeds can remain viable in soil for at least 6 years. The inflorescence (and

each flower) is strongly protogynous (Willson & Hennon, 1997). With maturity of the seeds, the spadix becomes fragile, disconnects from the flower stalk and sinks to the ground close to the mother plant.

In cultivation, *L. americanus* hybridizes with *L. camtschatcensis* (hybrids have a light yellow spathe). There are no closely related native species in Europe and hybridization with native *Araceae* seems very unlikely.

Habitat

L. americanus is native to western North America, where coastal marshes are dominated by the plant in forested or shaded areas, and the plant is often dominant in non-forested, semiterrestrial communities and in understories of open canopy stands. It can grow in light (sandy) to heavy (clay) soils of acid, neutral or basic reaction, and prefers deep wet soils. It can also grow in flowing or standing water. In general, *L. americanus* grows in marshes, fens, marshy woods, bog woodlands, along streams and riverbanks, lakesides, ponds, in seepage areas, in bogs, wet meadows and other wet areas at low to middle elevations. *L. americanus* is a nitrophilic species, favoured by nutrient-rich wetlands.

In its native range, *L. americanus* is often found with the trees *Alnus rubra*, *Picea sitchensis*, *Chamaecyparis nootkatensis* or *Thuja plicata*, the fern *Athyrium filix-femina*, the moss *Kindbergia praelonga* and the liverwort *Pellia neesiana*. In Germany, it often grows with *Sphagnum* mosses. Inflorescences are visited by a variety of small insects, slugs and snails. The chief pollinator in its native range is the beetle *Pelecomalius testaceum* (Willson & Hennon, 1997).

Environmental requirements

L. americanus can grow in shade or full light at an altitude of 0–1400 m. Although many neophytes are successful on sites modified by man and on strongly disturbed ground, but fail to invade vegetation close to nature (Lohmeyer & Sukopp, 1992), *L. americanus* invades sites that are much closer to nature, e.g. the swamp forest in the Taunus mountains of Germany (Alberternst & Nawrath, 2002).

Climatic and vegetational characterization

L. americanus is typically associated with climates Cf, Dfb and Dfc in Köppen's classification, i.e. cool to hot summer, very cold to cool winter, wet year round. *L. americanus* is hardy to at least to zone 7 (–15 °C). It is associated with the vegetation zones: temperate deciduous forests, mixed conifer forests, taiga forests, forest tundra.

Natural enemies

Squirrels (and also bears) feeds on fruits and seeds in the native range of *L. americanus* Hultén & St. John (1931). This has not been observed in its introduced range.

Geographical distribution

EPPO Region: Denmark (since 1981), Germany (since the 1980s), Ireland (since the 1960s), Netherlands (recent), Norway (since 2001), Sweden (since 1987), Switzerland (since 2003), UK (since 1947).

North America: Canada (British Columbia); USA (Alaska, California, Idaho, Montana, Oregon, Washington, Wyoming).

For further details see also: Clement & Foster, 1994; Doyle & Duckett, 1985; Fischer & Schausten, 1994; Fuchs *et al.*, 2003; Hickman, 1993; Korneck & Krause, 1990; Lenfors & Nilsson, 1987; Lind, 1988; O'Malley, 1996; and Preston *et al.*, 2002.

History of introduction and spread

L. americanus was imported into the UK at the beginning of the 20th century as a garden ornamental, and has since been sold in many European countries, including southern countries like Italy. The geographical distribution, with dates, given above relates to establishment in the wild, which up till now has occurred only in northern and central Europe. There is no indication of establishment in southern European countries. However, it is quite possible that the plant has already established in countries other than those of the above list, where the plant is sold. First findings in Germany were accidental.

Pathways of movement

After ripening, most seeds fall to the ground with the fading spadix. They can then be transported by running water. In the native range, small rodents like squirrels, birds and even bears transport the berries, and bury them as a winter stock (Rosendahl, 1911; Willson & Hennon, 1997). This has not yet been reported in Europe (Alberternst, pers. comm.). The main pathway of movement is the sale of artificially propagated rhizomes for planting in gardens. *L. americanus* is sold by many nurseries and is also readily available via the internet. It is possible also that fragments of stem or rhizome could be spread by machines and vehicles used for silviculture, as in construction of lanes, or tree cutting and transportation. In Germany (Taunus mountains), a gardener deliberately planted the species at many different locations in the wild (König & Nawrath, 1992).

Impact

Effects on plants

L. americanus has become established very locally in wet woodlands in the EPPO region. It can displace, and cause local extinction of, rare species of mosses (like *Aulacomnium palustre* and different *Sphagnum* species) and vascular plants (*Carex echinata*, *Viola palustris*, and orchids) (König & Nawrath, 1992, Alberternst & Nawrath, 2002). It has invaded nature conservation areas listed in EU Directive 92/43 (EU, 1992).

Environmental and social impact

L. americanus is used as a valued garden plant, and indeed has an Award of Garden Merit from the Royal Horticultural Society in the UK. According to the PPP-Index in 2005, it is available from over 100 growers in EU countries. The main risk for the environment is if *L. americanus* is allowed to establish in wet woodlands where it readily forms large colonies, displacing the native species, and spreading along waterways. Woodlands of this type are in some cases listed conservation areas. Though the plant is toxic (containing calcium oxalate raphides), this toxicity does not present a great risk to animals or man in practice.

Summary of invasiveness

Once introduced into a vulnerable location, *L. americanus* can progressively build up dense local populations, which displace the native vegetation. The large leaves build up dense layers of vegetation excluding light from other species. *L. americanus* produces many seeds, and a large seedbank can build up in the soil, remaining viable for at least 6 years. Young plants increase in size slowly but continuously, leaving no space for other plants to grow. Plants are vigorous and persistent, and winter-hardy down to -15°C .

L. americanus has limited potential to spread naturally to new locations, although it can be carried locally downstream from established colonies. Long-distance spread can most probably occur only with human assistance, i.e. deliberate planting in the wild or planting in a garden adjacent to a vulnerable location.

Control

Mechanical control

L. americanus can be controlled by hand pulling, repeated cutting or other mechanical removal to exhaust the rhizomes of the plant.

Chemical control

Chemical control has not been investigated, but would in any case be undesirable, if not actually prohibited, in the affected habitats.

Biological control

No information is available.

Possibilities for eradication

Eradication is feasible at early stages of infestation. Measures have to be repeated with the remaining plants, and success has to be monitored for at least 10 years, due to the viability of the seedbank. Though *L. americanus* is highly invasive, it occurs relatively infrequently at new sites and grows slowly. So eradication measures are feasible.

Regulatory status

In 2005, EPPO added *L. americanus* to its A2 action list, and endangered EPPO member countries are thus recommended to regulate it. Suggested measures are related to EPPO Standard PM 3/67 (OEPP/EPPO, 2007), with emphasis in particular on: the obligation to report findings; publicity; surveillance; establishment of an action plan for eradication when the plant is found.

References

- Alberternst B & Nawrath S (2002) [*Lysichiton americanus* newly established in Continental Europe. Is there a chance for control in the early phase of naturalization?]. *Neobiota* **1**, 91–99 (in German).
- Clement EJ & Foster MC (1994) *Alien Plants of the British Isles*. Botanical Society of the British Isles, London (GB).
- Doyle GJ & Duckett JG (1985) The occurrence of *Lysichiton americanus* on woodland bog, County Offaly, Ireland. *Irish Naturalists' Journal* **21**, 536–538.
- EU (1992) EU Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. *Official Journal of the European Communities* L206, 7.
- Fischer E & Schausten H (1994) [Botanical-floristical annual report for the administrative district of Koblenz 1992/1993]. *Fauna und Flora in Rheinland Pfalz Beihefte* **11**, 140–167 (in German).
- Fuchs R, Kutzelnigg H, Feige B & Keil P (2003) [Occurrence of *Lysichiton americanus* in the wild in Duisburg and Mülheim an der Ruhr]. *Tuexenia* **23**, 373–379 (in German).
- Hickman JC, eds (1993) *The Jepson Manual: Higher Plants of California*. University of California Press, Berkeley (US).
- Hultén E & St John H (1931) The American species of *Lysichiton*. *Svensk Botanisk Tidskrift* **25**, 453–464.
- König A & Nawrath S (1992) [*Lysichiton americanus* in the High Taunus]. *Botanik und Naturschutz in Hessen* **6**, 103–107 (in German).
- Korneck D & Krause A (1990) [*Lysichiton americanus*, a neophyte in the Hochtäunus]. *Hessische Floristische Briefe* **39**, 53–56 (in German).
- Larson D (2003) *Predicting the Threats to Ecosystem Function and Economy of Alien Vascular Plants in Freshwater Environments*. Report 2003: 7 of the Department of Environmental Assessments. Swedish University of Agricultural Sciences, (SE).
- Lenfors I & Nilsson NG (1987) [*Orontium aquaticum* and *Lysichiton americanus* found in S Halland]. *Svensk Botanisk Tidskrift* **81**, 37–39 (in Swedish).
- Lind F (1988) [The flora of Ostergötland – additions and corrections]. *Svensk Botanisk Tidskrift* **82**, 43–46.
- Lohmeyer W & Sukopp H (1992) [Agriophytes of the vegetation in Central Europe]. *Schriftenreihe für Vegetationskunde* **25**, 1–185 (in German).
- OEPP/EPPO (2007) EPPO Standard 3167 Management of invasive alien plants which have been intentionally imported. *Bulletin OEPP/EPPO Bulletin* **36** (in preparation).
- O'Malley J (1996) New plant records from South Kerry (H1) and North Kerry (H2). *Irish Naturalists' Journal* **25**, 298–299.
- Pellmyr O & Patt JM (1986) Function of olfactory and visual stimuli in pollination of *Lysichiton americanum* by a staphylinid beetle. *Madroño* **33**, 47–54.
- Preston CD, Pearman DA & Dines TD, eds. (2002) *New Atlas of the British and Irish Flora*. Oxford University Press, Oxford (GB).
- Rosendahl CO (1911) Observation on the morphology of the underground stems of *Symplocarpus* and *Lysichiton*, together with some notes on geographical distribution and relationship. *Minnesota Botanical Studies* **4**, 137–152.
- Schott HW (1857) Aroideae. *Österreichisches Botanisches Wochenblatt* **7**, 61–62 (in German).
- Walters M *et al.*, eds. (1984) *The European Garden Flora*, Vol. II. *Monocotylons (Part II)*, pp. 88–89. Cambridge University Press, Cambridge (GB).
- Willson MF & Hennon PE (1997) The natural history of western skunk cabbage (*Lysichiton americanus*) in southeast Alaska. *Canadian Journal of Botany* **75**, 1022–1025.