

Data sheets on quarantine pests

Fiches informatives sur les organismes de quarantaine

09-15106

Lysichiton americanus

Identity

Scientific Name: *Lysichiton americanus* Hultén & St John,

Taxonomic position: *Araceae*.

Common names: American skunk cabbage, yellow skunk cabbage, western skunk-cabbage, skunk-cabbage, swamp lantern (English), arum bananier, lysichite, fax-arum (French), skunk-kalla (Norwegian), gelbe scheincalla, amerikanischer riesenaronstab, amerikanischer stinktieroehl, amerikanische scheinkalla (German), gul skunkkalla, amerikansk skunkkalla (Swedish), keltamajavankaali (Finnish), moerasaronkelk, moeraslantaarn (Dutch)

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 semi-aquatic or terrestrial 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 reddish-brown seeds (5–11 mm) (FNA, 1993).

Similarities to other species *L. camtschaticensis* (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 smaller. Habitats are comparable (Hultén & St. John, 1931). *L. camtschaticensis* 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 in 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 self-compatible and is considered to be capable of self-pollination due to partial temporal overlap between male and female function in the inflorescences (Pellmyr & Patt, 1986).

In its native area of distribution, inflorescences are visited by a variety of small insects, slugs and snails and *L. americanus* is pollinated by adults of *Pelecomalius testaceum* (Coleoptera: Staphylinidae), which feed on the pollen and use the inflorescences as a mating site (Pellmyr & Patt, 1986). In France, Dipteran species have been observed on the species, and are assumed to be the species pollinating arums (Lebreton, 2007). Seeds can remain viable in soil for at least 8 years (B. Alberternst, pers. comm., 2009). 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 or cream spathe). There are no closely related native species in Europe and hybridization with native *Araceae* seems very unlikely.

Habitat

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 plicat*, the fern *Athyrium filix-femina*, the moss *Kindbergia praelonga* and the liverwort *Pellia neesiana*. In Germany, it often grows with *Sphagnum* mosses.

Environmental requirements

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. In its native range, the typical soil associated with this species in Alaska is Histosol (D'Amore and Lynn, 2002). In Southeast Alaska, North-west Canada, America and California the species is an obligate wetland species (Reed, 1988 and Fish and Wildlife Service, 1996). It is found in calcareous fens in Southeast Alaska, these fens can be classified floristically as the Sitka sedge-forb community type. In these calcareous fens, the pH values of 6.7 to 7.4 and calcium concentrations of 41.8 to 51.4 mg/L are recorded (McClellan *et al.*, 2003). Calcareous fens are a very unusual habitat for this area, and although *L. americanus* was found at two locations, it is likely that the conditions reported in this paper are not the ideal habitat for this species, and it is assumed that the species grows best in acidic saturated soils. It can also grow in flowing or standing water. The principal environmental factor determining presence of *L. americanus* is the absence of soil drainage in southeastern Alaskan forests (Hanley & Brady, 1996). According to Klinkenberg (2008), it is found in British Columbia at elevations between 358 and 1740 m.

In the EPPO region, it is found in the same conditions as in its native range, it can grow in acid or neutral permanently wet soils but grows better in deep humus rich soils. It has been observed in the Taunus (Germany) to grow in flowing or standing waters of up to 30 cm depth (Alberternst, pers. comm., 2009). It usually occurs in semi-shaded situations, tolerates shade and also grows well in full light. It can withstand cold temperatures (at least -15°C) (Plants for a future website, 2009).

In Europe, Fuchs (2008) determined the following abiotic factors for *L. americanus*:

- for light (4); semi-shade plant,
- soil moisture (9); plant often on waterlogged, badly aerated soils
- for soil nitrogen (5); intermediate fertility.

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

In its native range, this species is eaten by black tailed deer (*Odocoileus hemionus sitkensis*) (Gillingham *et al.*, 1997 and 2001) and by Grizzly bear (*Ursus arctos*) (Gyug, 2004). The fruits and seeds have not been reported as being eaten by animals in the EPPO region (Alberternst, pers. comm., 2006). Several species of slugs (Succineidae) and snails eating the leaves of *L. americanus* have been observed in the Haute-Vienne station in France (Lebreton, 2007), but this did not prevent the plant from establishing.

Geographical distribution

EPPO Region: Belgium (since 2006), Denmark (since 1981), Finland (since 2005), France (since 1995), Germany (since the 1980s), Ireland (since the 1960s), Netherlands (since 2004), 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).

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 such as 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.

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., 2009). 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 (e.g. *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. It is not a mass selling ornamental, but is readily available from garden catalogues and internet sites (e.g. available from 38 suppliers in Great Britain according RHS (2009). According to the PPP-Index in 2009 (ppp-index, 2009), *Lysichiton* spp. are available from 136 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 moderately harmful if eaten (containing calcium oxalate raphides), this 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 8 years.

Young plants increase in size slowly but continuously, leaving no space for other plants to grow. Plants are vigorous and persistent, and winterhardy 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 of *L. americanus* is feasible at early stages of infestation. Measures have to be repeated with the remaining plants. After eradication, monitoring only needs to be performed every 2 years since only older plants (3 years or older) produce seeds, and this should be undertaken for a duration of at least 8 years (duration of the seed bank). 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 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.

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Switzerland

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UK

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