

EPPO Prioritization Process for Invasive Alien Plants

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Limnophila sessiliflora



Limnophila sessiliflora, © AquaBie Website

The prioritization process assessment for *Limnophila sessiliflora* has been elaborated by the EPPO Secretariat and was reviewed by the EPPO Panel on Invasive Alien Plants in 2013.

Section A Prioritization process scheme for the elaboration of different lists of invasive alien plants (pests or potential pests) for the area under assessment

Init1 - Enter the name of the pest

Limnophila sessiliflora (Vahl) Blume

Init2 - Indicate the taxonomic position and synonyms

Plantaginaceae

Init3 - Clearly define the PRA area

The EPPO region (see map at http://www.eppo.int/ABOUT_EPPO/images/clickable_map.htm).

Init4 - Provide the reasons for performing this assessment, and report any risk analysis available for the assessed species.

Limnophila sessiliflora (Plantaginaceae) is an aquatic perennial plant originating from Asia. This species has been introduced into North America (Florida, Georgia and Texas) where it is considered invasive. The species is imported as an ornamental aquatic plant into the EPPO region, but so far has only been found as transient (= casual) in thermal waters in Slovakia (Somogyi, 1997; Eur+ Med Plant Database) and Hungary (Lukács *et al.*, 2008).

Considering the invasive behavior of this species in the USA, flowing freshwater bodies of the Mediterranean and Macaronesian countries may be at risk.

A.1 - Is the plant species known to be alien in all, or a significant part, of the area under assessment?

Yes

The species originates from Asia and is alien in the whole EPPO region.

A.2 - Is the plant species established in at least a part of the area under assessment?

No, the plant has never been observed in the wild in the EPPO region, or is only recorded as transient (= casual) and may be in the process of establishment.

The species has indeed been found in thermal ponds in Hungary (Lukács *et al.*, 2008) and in Slovakia (Somogyi, 1997) since 1995 near Bojnice, but is not considered as established (= naturalized).

The species is currently imported into the EPPO region as an aquatic ornamental plant in moderate amounts (11 800 plants imported into the Netherlands, France, Hungary and Estonia and coming from Indonesia and Singapore according to Brunel, 2009). The species is also sold on Turkish websites (Sahibinden.com <http://www.sahibinden.com/ilan/hayvanlar-alemi-aksesuarlar-balik-limnophila-sessiliflora-10dal-74949515/pasif-ilan/>; gitti gidiyo

<http://urun.gittigidiyor.com/evcil-hayvan-petshop/limnophila-sessiliflora-10dal-79666212>,

<http://urun.gittigidiyor.com/evcil-hayvan-petshop/limnophila-sessiliflora-5-adet-bitki-10-tl-75041132>).

A.3 – Is the plant species known to be invasive outside the area under assessment ?

Yes

L. sessiliflora is native to Asia (native): Bhutan, China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangsu, Jiangxi, Liaoning, Sichuan, Yunnan, Zhejiang), India, Japan (alien) (Honshu, Kyushu, Ryukyu Islands, Shikoku) Indonesia (Java, Kalimantan), Democratic People's Republic of Korea, Republic of Korea, Malaysia, Myanmar, Nepal, Philippines, Sri Lanka, Taiwan, Vietnam (see Discover Life Website; Yang & Yen, 1997).

It is also established in the USA (Florida, Georgia, Texas) and Bolivia.

L. sessiliflora is a weed in rice fields in China, India, Japan and the Philippines, although references mentioning these impacts are quite old, dating back to the 1970s (Ramey, 2001).

The plant is registered on the USA Federal Noxious Weed List and is regulated in some States: Alabama, California, Florida, Massachusetts, North Carolina, Oregon, South Carolina and Vermont (USDA-NRCS, 2013).

A.4 - Based on ecoclimatic conditions, could the species establish in the area under assessment?

Yes

The species is currently only transient (= casual) in the EPPO region and is found in thermal ponds.

The Center for Aquatic and Invasive Plants, University of Florida (Ramey, 2001) and Wisconsin Department of Natural Resources (Undated) consider that the species can survive at a minimum temperature of 15°C and a maximum of 28°C, while its optimum is comprised between 20°C and 26°C. However, Hall & Vandiver (2012) mention that the plant can tolerate low temperatures.

According to the Köppen-Geiger Climate Classification, *L. sessiliflora* is found in the USA as well as in its native range mainly in the Cfa zone: warm temperate, fully humid, hot summer, as well as in the Aw zone : equatorial, winter dry. A recent version of the World map of the Köppen-Geiger Climate Classification can be found at this link : http://people.eng.unimelb.edu.au/mpeel/Koppen/World_Koppen_Map.png.

The Cfa zones occurs in the EPPO region in the Adriatic coast of Italy and around the Black Sea (Northern Greece, Bulgaria, Romania, Russia, Turkey, etc.), while the Aw zone does not occur.

A niche model has been undertaken with GBIF. Although the GBIF portal worldwide distribution of *L. sessiliflora* is incomplete, in particular in its native range in tropical Asia, the climatically more similar occurrences of the species in its exotic range (i.e. Flora, Texas, Bolivia, Japan) may still be relevant to base a niche model projection on, as an approximation (see Figure 1).

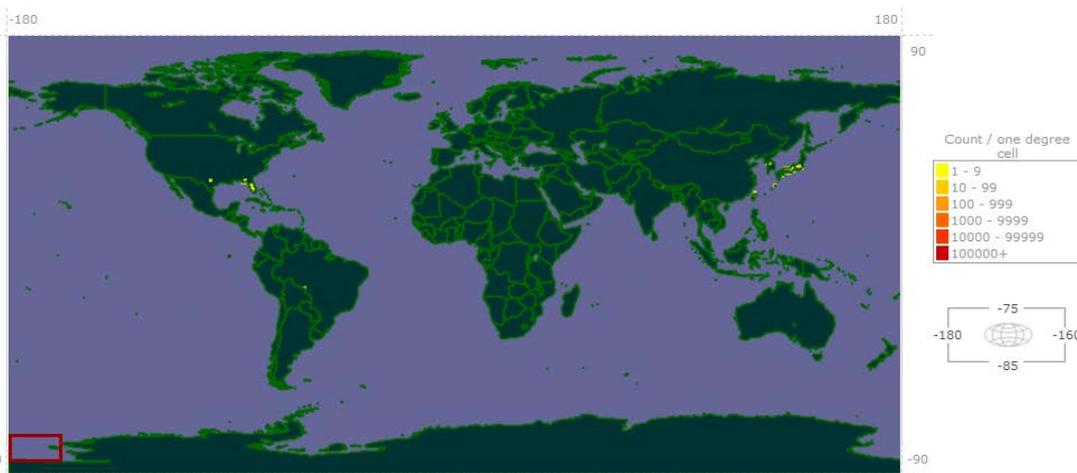


Figure 1: Worldwide distribution of *Linnophila sessiliflora* by GBIF. The distribution is incomplete in its native range, in particular in Asia.

Biodiversity occurrence data published by GBIF Data Portal, data.gbif.org, 2013-18-04.

When performing a GBIF niche model on the basis the incomplete GBIF worldwide distribution, and taking all the proposed parameters into account (i.e. annual mean temperature, mean diurnal range, isothermality, etc.), it appears that the EPPO region is climatically moderately suitable for *L. sessiliflora* to establish (see Figure 2).

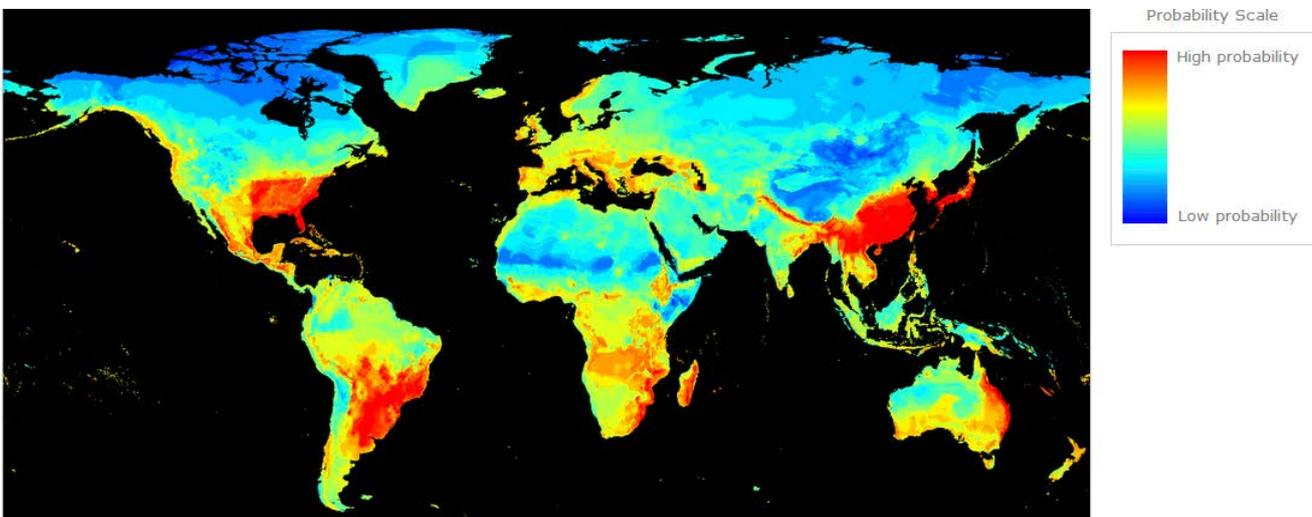


Figure 2: GBIF Niche Model projection of the potential worldwide distribution of *Linnophila sessiliflora*, on the basis of the incomplete GBIF worldwide distribution of the species, and taking all the parameters into account. Biodiversity occurrence data published by GBIF Data Portal, data.gbif.org, 2013-18-04.

Within the EPPO region, it appears that the areas most at risk are thermal waters, as well as the Adriatic coast (Albania, Bosnia and Herzegovina, Croatia, Greece, Italy) and the Black Sea (Georgia, Turkey, Russia) (see Figure 3). Such forecast is concordant with the Köppen-Geiger Climate Classification. Such maps are

nevertheless to be taken with caution, as the temperature of the water is the limiting factor for the species rather than the temperature of the air, while the GBIF niche model may be rather based on air temperatures.

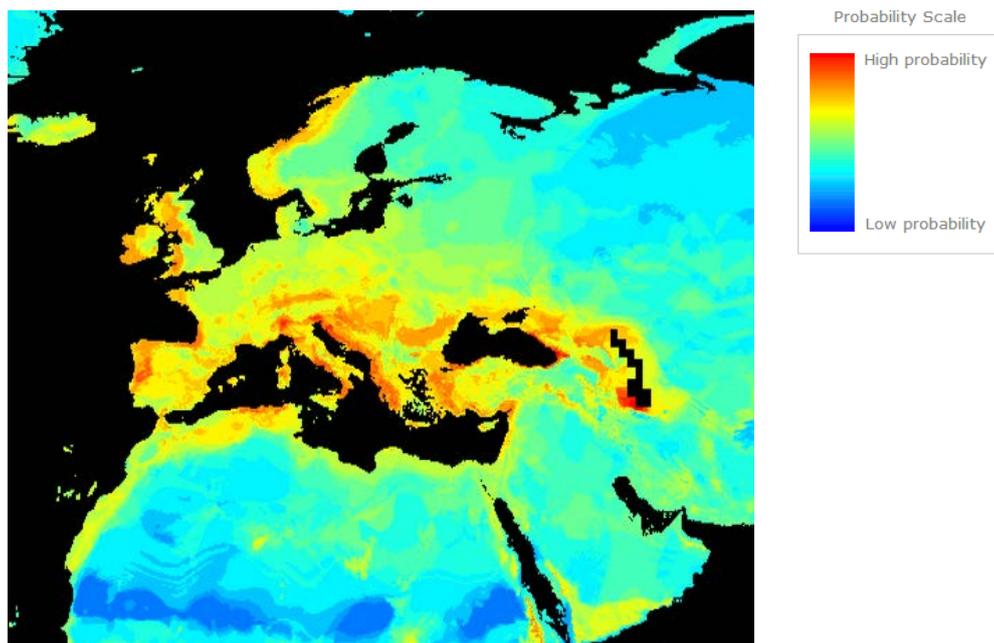


Figure 3: Detail of the EPPO region of the GBIF Niche Model projection of the potential worldwide distribution of *Limnophila sessiliflora*, on the basis of the incomplete GBIF worldwide distribution of the species, and taking all the parameters into account. Biodiversity occurrence data published by GBIF Data Portal, data.gbif.org, 2013-18-04.

Questions A.5, A.6, A.7 and A.8 all have to be assessed independently. The risk should be considered for the area under assessment where the species is able to establish and to cause damage. The risk should not be downgraded by making an average for the entire area under assessment, if it is different from the area of potential establishment.

As far as possible, evidence should be obtained from records of invasive behaviour in the area under assessment or in the EPPO region. Information on invasive behaviour elsewhere may also provide guidance.

It should be ensured that suitable habitats are present in the area under assessment, for instance, mangroves and some specific cropping systems are not found in the EPPO region.

Any impact through hybridization on native plant species, crops or wild crop relatives is also considered in this section.

A.5 - How high is the spread potential of the plant in the area under assessment?

High

Level of uncertainty: High

L. sessiliflora is a fast growing plant which can grow in waters up to three meters deep. It is reported to flower for a long period: from April to November in Japan, and from July to November in Northern Florida and Texas. *L. sessiliflora* reproduces very efficiently sexually. The fruit it produces may contain up to 150 seeds according to Hall & Vendiver (2003). Spencer & Bowes (1985) report 200-300 seeds per fruit with a germination rate as high as 96%. In addition, *L. sessiliflora* does not only reproduce by seeds but can also regrow from fragments, though vegetative reproduction is considered to be limited by Spencer & Bowes

(1985).

The species spreads naturally as individual plants/fragments spread via water currents, or through floating mats (particularly with heavy rains). Machinery used in waterways has also been reported to spread the species. The spread potential of the species is therefore assessed as high, though, as available records originate from outside the EPPO region as the species is not established in the EPPO region, the uncertainty is ranked as high.

A.6 - How high is the potential negative impact of the plant on native species, habitats and ecosystems in the area under assessment?

List natural and semi-natural habitats where the species is known to occur. It includes all EUNIS habitat types 1 (<http://eunis.eea.europa.eu/habitats-code-browser.jsp>), except I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

Medium

Level of uncertainty: Medium

L. sessiliflora is reported in a variety of habitats, including swamps, ditches, lakes, rice fields and damp soils. According to the Corine Land Cover nomenclature, the following natural or semi-natural habitats are invaded: Inland surface waters [C].

L. sessiliflora is reported to be able to shade out and thus to outcompete totally submerged species (Ramey, 2001). It can start growing in low light before other plants can do so, as it is shade adapted (Ramey, 2001). In addition, a toxin present in the stem tissue may prevent herbivorous fish from eating the plant (Hall & Vandiver, 2003).

When assessing the weed potential in Florida of *Limnophila sessiliflora* and of *Hygrophila polysperma* (Acanthaceae), and comparing it with *Hydrilla verticillata* (Hydrocharitaceae), Spencer and Bower (1985) concluded that neither plant pose as much of a threat as *H. verticillata*, but that *H. polysperma* would have more potential to be invasive than *L. sessiliflora*. Indeed, in Florida, the species has not become a nuisance during the past 25 years (Ramey, 2001).

Within the EPPO region, the climatic conditions are expected to be marginally suitable for the species, compared to a tropical climate. The potential impacts are therefore only expected to be medium. As there are few references on the *L. sessiliflora* except the studies in Florida, uncertainty is thus ranked as medium.

A.7 - How high is the potential negative impact of the plant on agriculture, horticulture or forestry in the area under assessment?

The habitats and the situations in which the species has negative impact on agriculture, horticulture or forestry should be listed. It includes EUNIS habitat (<http://eunis.eea.europa.eu/habitats-code-browser.jsp>) I (Regularly or recently cultivated agricultural, horticultural and domestic habitats) and J (Constructed, industrial and other artificial habitats).

Medium

Level of uncertainty: High

According to the Corine Land Cover nomenclature, the following habitats are invaded: Arable land and market gardens [I1].

Ramey (2001) reports that *L. sessiliflora* is a weed in rice fields in China, India, Japan and the Philippines, but references mentioning these impacts are quite old, dating back to the 1970s (Misra & Tripathy, 1975; Takematsu, 1976).

In Japan, the plant is reported to be resistant to sulfonylurea herbicides (Miyahara *et al.*, 1998 ; Wang *et al.*, 2000).

A hybrid between *L. sessiliflora* and *L. indica* has been found to be a weed in rice in Italy near Ferrara (Piccoli, 1974), as the two plants were in cultivation for aquaria. No further information could be found on the presence of this hybrid in Italy.

L. sessiliflora has also been reported to clog irrigation and flood-control canals, as well as pumping and power stations, but no further information could be found on such impacts (Ramey, 2001).

As very scarce information on potential negative impacts of the plant on agriculture, the uncertainty is ranked as high.

A.8 - How high are the potential additional impacts (e.g. on animal and human health, on infrastructures, on recreational activities, other trade related impacts such as market losses)?

Low

Level of uncertainty: High

A large surface biomass of *L. sessiliflora* could be a nuisance for recreational activities. Though, as there is no record of such impact, the uncertainty is ranked as high.

Responses to questions on impacts (A.6, A.7 and A.8) should be reported in the matrix in Fig. 2 in order to categorize the species. The highest score should be considered; however, impacts listed in question A.8 cannot be taken on their own as the highest impacts. Only if A.6 and/or A.7 is medium and A.8 is high should the overall impact be considered high.

Those species that have both a high spread potential and a high impact (either on cultivated or uncultivated ecosystems) are included in the list of invasive alien plants. Species with either medium spread or impacts are included in the observation list of invasive alien plants. Species with low spread and high impact are included in the observation list of invasive alien plants. All other species are registered on the list of minor concern.

The conclusions of the process can be presented in a matrix (see Fig. 2).

		A5 -Spread potential		
		Low	Medium	High
Adverse impacts (maximum rating from questions A6, A7. and A.8)	Low	List of minor concern	List of minor concern	List of minor concern
	Medium	List of minor concern	Observation list of invasive alien plants	Observation list of invasive alien plants
	High	Observation list of invasive alien plants	Observation list of invasive alien plants	List of invasive alien plants

Fig. 2 matrix combining spread potential and adverse impacts.

The answer provided to question A.5 on the spread potential of the species assessed was:

High

The answer provided to question A.6 on negative impact on native species, habitats and ecosystems was:

Medium

The answer provided to question A.7 on negative impact on agriculture, horticulture or forestry was:

Medium

The answer provided to question A.8 on additional impacts was:

Medium

According to the ratings provided, the assessed species falls into the:

Observation list of invasive alien plants

A.9 - The overall uncertainty for Part A of the EPPO prioritization process for invasive alien plants should be summarized:

High

Although the species is being imported into the EPPO region, and is present and regulated in the United States, the species has so far neither established in the EPPO region, nor exhibited an invasive behavior, and there is therefore very limited published information on this species.

Only the species resulting in the list of invasive alien plants, should be assessed through Section B 'Prioritization process scheme for the identification of (potential) invasive alien plants for which a PRA is needed'.

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