European and Mediterranean Plant Protection Organization
Organisation Européenne et Méditerranéenne pour la Protection des Plantes

EPPO Prioritization Process for Invasive Alien Plants

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Asparagus asparagoides

Asparagus asparagoides, © http://www.westfordbridge.co.za/flora/asparagus_asparagoides.htm

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
Asparagus asparagoides (Linnaeus) Druce

Init2 - Indicate the taxonomic position and synonyms
Asparagaceae
Synonyms:
Elide asparagoides (Linnaeus) Kerguélen
Medeola asparagoides Linnaeus
Myrsiphyllum asparagoides (Linnaeus) Willdenow

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.
Asparagus asparagoides (Asparagaceae) is a rhizomatous perennial climbing vine originating from South Africa. This species is invasive in Australia. It is used as an ornamental plant in the EPPO region, and is established in the the Azores (PT), Corsica (FR), France, Canary Islands (ES), Madeira (PT), Malta, Morocco, Portugal, Spain, Sicily (IT) and Tunisia. Considering the invasive behavior of this species elsewhere in the world as well as in EPPO countries, it is considered that 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 South Africa 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?
Yes.
The species is established in some Mediterranean countries of the EPPO region: in the Azores (PT) (Euro+Med Plant Base), Corsica (FR) (Paradis & Piazza, 2004), France (SILENE (2013), Canary Islands (ES) (Euro+Med Plantbase), Madeira (PT) (Euro+Med Plantbase), Malta (Euro+Med Plant Base), Morocco (Ibn & Fennane, 2008), Portugal (Tutin *et al*., 1976-1980), Sicily (IT) (Euro+Med PlantBase), Spain (GBIF Portal) and Tunisia (Le Floc'h *et al*., 2010).
The species is recorded as casual (= transient) in Sardinia (Podda *et al*., 2012).

Furthermore, the species is native to:
- Africa: Ethiopia, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe (Kleinjan & Edwards, 1999).

The species has also been introduced in :
- North America: Mexico, USA (California (California Invasive Plant Council, 2013; Hawaii, (Starr *et al*., 2002)).
- Central and South America: Argentina, Guatemala, Uruguay (USDA-GRIN, 2013).
- Oceania : Australia (New South Wales, Queensland, South Australia, Tasmania, Victoria, Western Australia (Australia's Virtual Herbarium Website), New Zealand (Popay *et al*., 2010).

The GBIF worlwide distribution map of *A. asparagoides* fits quite well with its known occurrences, except for some occurrences in Central and South America and in the Mediterranean Basin (see Figure 1).

Figure 1: GBIF worldwide distribution for *Asparagus asparagoides*. Records are missing in Central and South America and in the Mediterranean Basin.
Biodiversity occurrence data accessed through GBIF Data Portal, data.gbif.org, 2013-04-22.

The GBIF Niche Model, taking all the parameters into account, indicates that the Mediterranean and Atlantic areas are suitable for *Asparagus asparagoides* to establish (Figure 2).

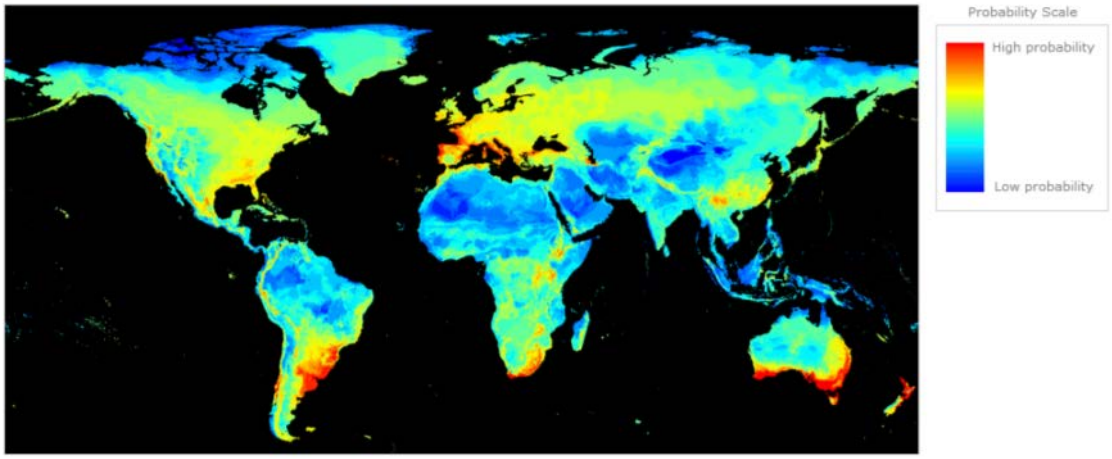

Figure 2 : Worldwide Projection of the GBIF Niche Model for *Asparagus aspagoides*.
Biodiversity occurrence data accessed through GBIF Data Portal, data.gbif.org, 2013-04-22.

Scott & Batchelor (2006) undertook climatic projections for Asparagus species. Their parameters for the *Asparagus asparagoides* species which is widespread in Australia have been taken to run CLIMEX. The Mediterranean Basin and the Atlantic coast are considered to be suitable for the establishment of the species. The outcome of this projection is very consistent with the GBIF niche model, as shown in Figure 3. The species is also considered to be able to establish in French Overseas departments (Antilles and Réunion) according to the risk analysis for these areas undertaken by Le Bourgeois & Camou (2006).

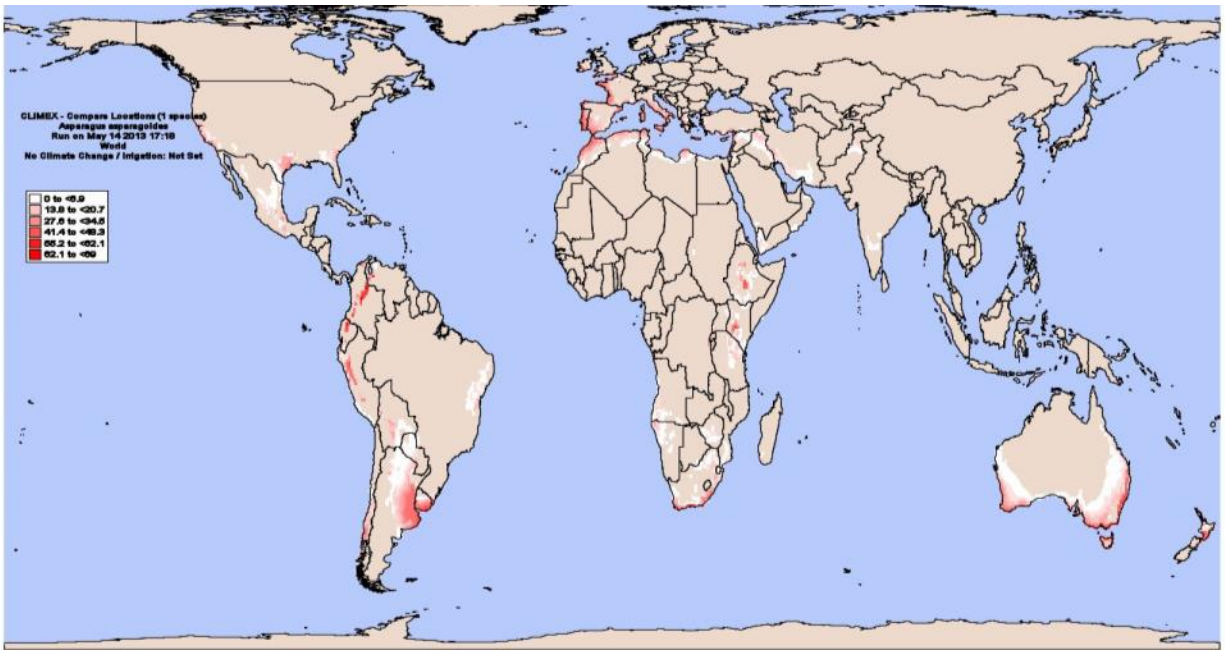

Figure 3: Worldwide projection for *Asparagus aspagoides* with CLIMEX, taking the parameters of Scott & Batchelor (2006).

Furthermore, the species is known to be used as an ornamental plant. In the EPPO region, it is thought to have escaped from gardens. For instance in Corsica, it was introduced by a horticulturist in 1900 (Paradis & Piazza, 2004), and Paradis (2002) followed the spread of the species near Ajaccio from gardens. No internet trade could be retrieved for this species, and no sellers were reported in the PPP index, but the species was indicated as traded in 3 nurseries according to the Royal Horticultural Society (2004-2005).

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?

Medium

Level of uncertainty: Medium

Flowers of *A. asparagoides* are bisexual and self-compatible, and may also be pollinated by bees (Raymond, 1999). Fruit production may exceed 1 000 berries/m² per year (ARMCANZ, 2001). Seed viability is reported to approach 90% and seed longevity is about 2-3 years (CRC Weed Management, 2003). The species may also reproduce vegetatively through rhizomes, as a new plant can regrow from rhizome fragments (Muyt, 2001).

When the plant colonizes river banks, seeds may also be dispersed downstream by water flow. In Australia, it was highlighted that 93% of *A. asparagoides* occurrences were within 500 m of watercourses (Pigott *et al*., 1996). Nevertheless, only rare long distance dispersal has been observed in Australia (Stansbury, 2001). Seeds may also be dispersed by rabbits and foxes (CRC Weed Management, 2003), as well as by frugivorous birds (Stansbury, 2001), and bird dispersal was also observed in Corsica (Paradis, 2002), this may nevertheless also remain a rare event.

Careless disposal of garden waste and earthworks (e.g., roadside grading) can spread rhizomes over considerable distances (Stansbury & Scott, 1999). Seeds are also transported in mud attached to machinery and vehicles or cloth (Parsons & Cuthbertson, 2001).

It has been estimated in Australia that patches of about 10 m² expanded radially by approximately 0.6 m per year (Stansbury & Scott, 1999).

Although this species has been present in the Mediterranean Basin, which is suitable for establishment and spread of the species, since the 19th century, populations of the species remain stable. In Sicily, although reported as established since 1858, the populations are stable (G. Domina, University of Palermo, pers. com., 2013) (see question A.6 for further details on the situation in countries).

As there is conflicting records from the spread capacity of the species in Australia, and that which is observed in the EPPO countries, the uncertainty is ranked as medium.

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 in 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).

High

Level of uncertainty: High

In its native range in South Africa, *A. asparagoides* mainly occurs as a minor understory species. In contrast, it invades a variety of habitats in warm temperate climates of Australia and New Zealand including coastal heath or sandy dunes, woodlands or forests, creek and river banks, swamps, dry coastal vegetation, dry and damp sclerophyll open-forest, and littoral rainforest.
According to the Corine Land Cover nomenclature, the following natural or semi-natural habitats are invaded: Littoral zone of inland surface waterbodies [G2], Broadleaved deciduous woodland [G1], Broadleaved evergreen woodland [G2], Coniferous woodland [G3], Mixed deciduous and coniferous woodland [G4], Lines of trees, small anthropogenic woodlands, recently felled woodland, early-stage woodland and coppice [G5].

In Australia, *A. asparagoides* grows very quickly and rapidly dominates and smothers understory vegetation (Muyt, 2001) and changes the structure, floristic composition and richness and ecology of the system (Stephens *et al*., 2008). Plant colonies may form a dense tuberous mat underground, preventing other plants from accessing soil moisture and nutrients (Anonymous, 2000). Once the species is established, the amount of light reaching the soil surface is very low, thereby preventing other plants from persisting (Raymond, 1999).
In Australia, *A. asparagoides* poses a direct threat to at least 17 native plant species in South Australia and New South Wales (Quarmby, 2006; Downey, 2006). It is also a threat to four endangered ecological communities in New South Wales (Coutts-Smith & Downey, 2006), and further endangered communities may be at risk (Downey, 2006).
The species is declared a Weed of National Significance in Australia, and it is regulated in all Australian States (Weeds Australia Website).
In California, the species has an alert status and it has a moderate overall score to its Plant Assessment Form (though impact on plant communities is ranked as severe, California Invasive Plant Council, 2013).

Within the EPPO region, *Asparagus asparagoides* is regulated in the whole of Spain (including the Canary Islands), and its entry, possession, transport and trade are prohibited (Ministerio de agricultura, alimentación y medio ambiente, Boletín Official de Estado, Lunes 12 de diciembre de 2011).
In Corsica, the dense mats of *A. asparagoides* are reported to threaten the native and rare plant *Prasium majus* (Paradis & Piazza, 2004).
In France, *A. asparagoides* is present in Var and Alpes-Maritimes since the 1970s. H. Michaud (Conservatoire Botanique National Méditerranéen, pers. com., 2013) reports that the species is present from Toulon to the Italian border in the warmest areas, which receive at least moderate rainfall. The species displays an invasive settlements around habitations (as for example in Monts Alba and Boron situated in between Nice and Villefranche-sur-Mer), as well as in areas moderately degraded by human activities. Alziar & Salanon (1996) also considered the species as invasive in the Var department in Mont Boron (near Nice) and in the Esterel to a lower extent. Henri Michaud (Conservatoire Botanique National Méditerranéen, pers. comm., 2013) mentions that *A. asparagoides* has also been observed in undisturbed littoral Mediterranean scrub and thickets, but that these records remain situated near habitations. Once established, the species remains in an area. For example, it is present since 1925 in the St-Jean rock in Hyères. The species forms stands that may outcompete other species, but so far, in the St-Jean rock, species considered as fragile such as *Convolvulus siculus* and *Lamarckia aurea* are still present despite *Asparagus asparagoides* being abundant there.
In Malta, the plant has been cultivated as an ornamental plant, but its cultivation is decreasing (Lanfranco, 2005). The species is however not considered invasive in Malta nor as imposing a to be a threat to local biodiversity (L Schembri Gambin, Malta Environment and Planning Authority, pers. com., 2013).
Although it is present in the Azores (PT), Canary Islands (ES) and Madeira (PT), *A. asparagoides* is not listed in the Top 100 invasive terrestrial fauna and flora in Azores, Madeira and Canaries (Silva *et al*., 2008).
In Sicily, the species has been established since at least 1858 according to Parlatore (1958), and the population is stable and does not exhibit invasive behaviour (G. Domina, University of Palermo, pers. com., 2013).

As most information on impacts originates from other continents while conflicting information is found in the EPPO region, the uncertainty is ranked as high.

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 man-made habitats are invaded: Arable land and market gardens [I1], Cultivated areas of gardens and parks [I2], Transport networks and other constructed hard-surfaced areas [J4], Highly artificial man-made waters and associated structures [J5], Waste deposit [J6].

A. asparagoides is not known to invade agricultural systems, except for citrus orchards in irrigated areas of Australia, where it smothers trees and prevents the normal growth of citrus roots leading to reduced fruit production. It is estimated that at least 20% of growers who manage a total of more than 6500 ha of citrus orchards in districts bordering the Murray River in Australia, are affected by *A. asparagoides*. The cost of control is estimated to be as high as 2000 AUD per hectare and per year. *A. asparagoides* is also reported to interfere with the picking of citrus and avocados (CRC Weed Management, 2003).
A. asparagoides does not invade pastures as it cannot withstand constant grazing. It invades pine plantations, but it is not perceived to have a significant impact on tree growth (Kwong & Holland-Clift, 2004).

As the information on impacts originates from other continents, 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: Medium
It is reported that plant shoots can form dense mats which die-back in the summer, creating a fire hazard (Anonymous, 2000), though, no further information could be found on this point.

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

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
Most references report impacts in Australia, the overall uncertainty is therefore ranked as high.

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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