Appendix A

# Harmonia$^{+PL}$ – procedure for negative impact risk assessment for invasive alien species and potentially invasive alien species in Poland

## QUESTIONNAIRE

## A0 | Context

Questions from this module identify the assessor and the biological, geographical & social context of the assessment.

**a01**. Name(s) of the assessor(s):

first name and family name

1. Anna Krzysztofiak
2. Michał Śliwiński
3. Władysław Danielewicz

acomm01. Comments:

| | degree | affiliation | assessment date |
|---|---|---|---|
| (1) | dr | Wigry National Park | 19-06-2018 |
| (2) | dr | independent expert | 10-03-2018 |
| (3) | dr hab. | Department of Forest Botany, Faculty of Forestry, Poznań University of Life Sciences | 21-03-2018 |

**a02**. Name(s) of ***the species*** under assessment:

Polish name: Winobluszcz zaroślowy

Latin name: ***Parthenocissus inserta*** (A.Kern.) Fritsch

English name: False Virginia-creeper

Współfinansowano w ramach projektu nr POIS.02.04.00-00-0100/16 pn. *Opracowanie zasad kontroli i zwalczania inwazyjnych gatunków obcych wraz z przeprowadzeniem pilotażowych działań i edukacją społeczną* ze środków Unii Europejskiej w ramach Programu Infrastruktura i Środowisko 2014-2020

acomm02. Comments:

Nomenclature has been suggested by Mirek et al. (2002 – P) and The Plant List (2013 – B).

Synonyms of the Latin name (with the exception of given below): *Parthenocissus quinquefolia* var. *vitacea* (Knerr.) L.H.Bailey; *Amelopsis hederacea* var. *dumetorum* Focke; *Amelopsis inserta* A. Kerner; *Amelopis quinquefolia* (L.) Michx.; *Cissus quinquefolia*, Sol. ex Sims; *Parthenocissus dumetorum* (Focke) Rehder; *Parthenocissus quinquefolia* auct. Eur-Med. non (L.) Plachon; *Vitis inserta* A. Kern (National Inventory of Natural Heritage 2011, DAISIE 2018, Go Botany 2018 – B);*Vitis vitacea* (Knerr.) Bean; *Psedera vitacea* (Knerr.) Greene.

| Polish name (synonym I) | Polish name (synonym II) |
|---|---|
| winobluszcz amerykański | dzikie wino |
| Latin name (synonym I) | Latin name (synonym II) |
| *Parthenocissus vitacea* (Knerr) A.S. Hitchcock | *Amelopsis quinquefolia* (L.) Michx. var. *vitacea* Knerr |
| English name (synonym I) | English name (synonym II) |
| Thicket-creeper | Woodbine |

**a03**. **Area** under assessment:

**Poland**

acomm03. Comments:

–

**a04**. **Status** of *the species* in Poland. *The species* is:

| | |
|---|---|
| | native to Poland |
| | alien, absent from Poland |
| | alien, present in Poland only in cultivation or captivity |
| | alien, present in Poland in the environment, not established |
| **X** | alien, present in Poland in the environment, established |

aconf01. Answer provided with a

| low | medium | high | level of confidence |
|---|---|---|---|
| | | **X** | |

acomm04. Comments:

This species has been present in Poland probably since the first decade of 19th century, however the year 1806 suggested by Hereźniak (1992 – P as cited in Witkowska-Żuk 1992 – P), may refer to Virginia creeper *P. quinquefolia*. This species is classified in Poland as an invasive neophyte – classified into 2nd invasion category, the group of alien, established and regionally invasive species (Tokarska-Guzik et al. 2012 – P).

**a05**. The impact of *the species* on major domains. *The species* may have an impact on:

| | |
|---|---|
| **X** | the environmental domain |
| **X** | the cultivated plants domain |
| | the domesticated animals domain |
| **X** | the human domain |
| **X** | the other domains |

acomm05. Comments:

This species was originally connected with areas of low-rise buildings (Werpachowski and Biereżnoj-Bazille 2015 – P) or industrial areas (Kowarik 1991, Woźniak 2001, Brandes 2005, Jędrzejko and Olszewski 2008, Klera and Bacieczko 2013 – P, Praca zbiorowa 2016 – I). This species has been reported many times in the natural environment (Blicharski and Pawlikowski 2005, Wójcik 2008 – I, Marciniuk 2009, Sadowska 2011, Oklejewicz et al. 2012, Koba 2014 – P), where it forms a rich bank of seeds (Obidziński et al. 2016 – P). This species

has a negative impact on the environment by inhibiting the growth of native species of herbaceous plants as it densely covers the invaded soil (Adamowski et al. 2008, 2012 – P, Heise 2014 – N, Dajdok et al. 2015, Wróbel 2015, Starodubtseva et al. 2017 – P), and on trees and shrubs by creeping on them, and consequently loading them which cause breaking of boughs and even whole individuals (Krzysztofiak and Krzysztofiak 2018 – A). It also enters into nature reserves (Wika and Gorczyca 2006 – P) and national parks (Klasa and Sołtys-Lelek 2013, Kripluk and Bomanowska 2015, Werpachowski and Biereżnoj-Bazille 2015 – P, Krzysztofiak and Krzysztofiak 2018 – A). According to some reference materials, it has healing properties (Aga Radzi – I), others say that its fruits are poisonous for humans, and the contact with the plant may cause sensitisation in the form of rash and blisters (Booy et al. 2015 – P, NC State University 2018, Zielony Front 2018 – I). This species has a positive impact on birds, which eat its fruits (Bzdoń 2009, Sołtys-Lelek and Barabasz-Krasny 2010, Kruszewicz 2011, Omelchuk et al. 2011 – P, Pilkington 2011 – B, Zieliński et al. 2012, Wołkowycki 2014 – I) and on honeybees – its flowers are melliferous and during the flowering period, the species provides an important source of food for the honey bee(Bugała 1979, Flaga 2000 – P, Krzysztofiak and Krzysztofiak 2018 – A). Only few authors claim that this species does not pose a threat to vegetation (Matejecek 2008 – P). As a vector for fungi pathogenes, it can affect plant crops – blackberries, raspberries and grapevines (Plantwise Knowledge Bank 2018 – B). It can also positively affect building facilities (Borowski 1996b, Denisow et al. 2014, Wróbel 2017 – P) (compare a30).

## A1 | Introduction

Questions from this module assess the risk for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation. This leads to *introduction*, defined as the entry of *the organism* to within the limits of *the area* and subsequently into the wild.

**a06**. The probability for ***the species*** to expand into Poland's natural environments, **as a result of self-propelled expansion** after its earlier introduction outside of the Polish territory is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf02. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm06. Comments:

This species is dispersed by birds, which feed on its fruits (Bzdoń 2009, Sołtys-Lelek and Barabasz-Krasny 2010, Omelchuk et al. 2011 – P, Pilkington 2011 – B, Zieliński et al. 2012, Wołkowycki 2014 – I, Praca zbiorowa 2016 – I). According to some source materials, seeds of this species can be dispersed through water (hydrochoric dispersion) (Omelchuk et al. 2011, Klasa and Sołtys-Lelek 2013 – P). This species occurs in neighbouring countries of Poland, thus, its spontaneous expansion to Poland is probable.

**a07**. The probability for *the species* to be introduced into Poland's natural environments by **unintentional human actions** is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf03. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm07. Comments:

Seeds and plant parts, which can be the beginning of a new plant, are very likely to spread with soil during various construction investments, particularly linear investments

(Krzysztofiak and Krzysztofiak 2018 – A). Like many other alien species, also this species spreads along railways (Wójcik 2011, Wrzesień 2012, Wołkowycki and Banaszuk 2016 – P). This species can spread spontaneously from built-up areas and wild rubbish damps where biomass from allotments is thrown away (Pilkington 2011 – B, Eichmann and Afranowicz-Cieślak 2014 – P). This species is also likely to be transported from neighbouring or even more distant countries with seedlings of trees or shrubs.

**a08**. The probability for *the species* to be introduced into Poland's natural environments by **intentional human actions** is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf04. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm08. Comments:

This species is introduced as a groundcover plant which greens walls, summer houses, roofs, fences, and trellis (Ricotta et al. 2010 – P, Brandes 2012 – I, Eichmann and Afranowicz-Cieślak 2014, Steube and Brandes 2014, Muras 2016 – I, Wróbel 2017 – P, Zielony Front 2018 – I), as well as sound barriers along expressways in Poland (BUD MASZ – I). It is also used to reinforce embankments against air and water erosion of soil (Marczyńsk 2010 – I).

## A2 | Establishment

Questions from this module assess the likelihood for *the species* to overcome survival and reproduction barriers. This leads to *establishment*, defined as the growth of a population to sufficient levels such that natural extinction within *the area* becomes highly unlikely.

**a09**. Poland provides **climate** that is:

| | |
|---|---|
| | non-optimal |
| | sub-optimal |
| **X** | optimal for establishment of *the species* |

| | | | | | |
|---|---|---|---|---|---|
| aconf05. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm09. Comments:

Within the native range of its occurrence in North America – from south states of the USA to Ontario and Quebec provinces in Canada (NPGS 2018 – I), the climatic conditions are similar to those in Poland. Consequently, this species finds optimal conditions for living and further spread in Poland.

**a10**.Poland provides **habitat** that is

| | |
|---|---|
| | non-optimal |
| | sub-optimal |
| **X** | optimal for establishment of *the species* |

| | | | | | |
|---|---|---|---|---|---|
| aconf06. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm10. Comments:

This species is observed in anthropogenic (artificial or distorted) sites, in woods, at river and lake banks, in slope wastes and rocky sides (Go Botany 2018 – I). It has low requirements for soil, is tolerant for shadow, water shortage and relatively high pollution of the air with smoke and dust. Poland has appropriate conditions for its establishments – not only in built-

up areas (Bugała 1979 – P, Zając et al. 2015, Paszek et al. 2017, Wróbel 2017 – P, Budujesz.info 2018 – I), but also in scrub at rivers and oxbow lakes (Wilk 2004, Tyc 2007 – P) and in woods (Michalik 1991 – N, Blicharski and Pawlikowski 2005, Kołaczkowska et al. 2013, Wołkowycki 2014 – I).

## A3 | Spread

Questions from this module assess the risk of *the species* to overcoming dispersal barriers and (new) environmental barriers within Poland. This would lead to spread, in which vacant patches of suitable habitat become increasingly occupied from (an) already-established population(s) within Poland.

Note that spread is considered to be different from range expansions that stem from new introductions (covered by the Introduction module).

**a11**. The capacity of *the species* to disperse within Poland by natural means, **with no human assistance**, is:

| | |
|---|---|
| | very low |
| | low |
| | medium |
| | high |
| **X** | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf07. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm11. Comments:

Approximation (C-type data): This species is spontaneously dispersed in Polish botanical gardens, cities and woods (Danielewicz and Maliński 2003 – P). It propagates through seeds and rooting shoots. Birds eat fruits and disperse seeds over large distances (Bzdoń 2009, Sołtys-Lelek i Barabasz-Krasny 2010, Omelchuk et al. 2011 – P, Pilkington 2011 – B, Zieliński et al. 2012 – P, Wołkowycki 2014, Praca zbiorowa 2016 – I). It easily invades new areas where it forms dense communities, or grows on trees and shrubs, often enters protected areas such as nature reserves and national parks (Projekty.GDOS – I, Sołtys-Lelek and Barabasz-Krasny 2010, Klasa and Sołtys-Lelek 2013, Kirpluk and Bomanowska 2015, Werpachowski and Biereżnoj-Bazille 2015 – P, Krzysztofiak and Krzysztofiak 2018 – A).

**a12**. The frequency of the dispersal of *the species* within Poland by **human actions** is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf08. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm12. Comments:

This species is still intentionally introduced to cities, from where it spreads to adjacent areas (Chwastek 2011, Jaźwa 2012, Kirpluk 2012 – P), and even further. It is a popular groundcover for fences, summer houses, and embankments at residential buildings and in gardens. It is also recommended that this species is planted at sound barriers along expressways, and at other technical objects, such as fences surrounding wastewater pumping stations (Olszewski 2009 – P, Marczyński 2010 – I, Klasa and Sołtys-Lelek 2013, Eichmann and Afranowicz-Cieślak 2014, Werpachowski and Biereżnoj-Bazille 2015 – P, Muras 2016 – I, Wróbel 2017 – P, Krzysztofiak and Krzysztofiak 2018 – A, Zielony Front 2018 – I). According to the conducted survey (Employees of botanical gardens… 2018 – N), this species is included in collections of eight botanical gardens and arboreta in Poland – 30 individuals occupy the total surface of 200 $m^2$. Three institutions confirmed the spontaneous spread of these plants.

## A4a | Impact on the environmental domain

Questions from this module qualify the consequences of *the species* on wild animals and plants, habitats and ecosystems.

Impacts are linked to the conservation concern of targets. Native species that are of conservation concern refer to keystone species, protected and/or threatened species. See, for example, Red Lists, protected species lists, or Annex II of the 92/43/EWG Directive. Ecosystems that are of conservation concern refer to natural systems that are the habitat of many threatened species. These include natural forests, dry grasslands, natural rock outcrops, sand dunes, heathlands, peat bogs, marshes, rivers & ponds that have natural banks, and estuaries (Annex I of the 92/43/EWG Directive).

Native species population declines are considered at a local scale: limited decline is considered as a (mere) drop in numbers; severe decline is considered as (near) extinction. Similarly, limited ecosystem change is considered as transient and easily reversible; severe change is considered as persistent and hardly reversible.

**a13**. The effect of *the species* on native species, through **predation, parasitism or herbivoryis**:

| | |
|---|---|
| **X** | inapplicable |
| | low |
| | medium |
| | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf09. | Answer provided with a | low | medium | high | level of confidence |

acomm13. Comments:

This species is a plant which does not affect the native species through predation, parasitism or herbivory.

**a14**. The effect of *the species* on native species, through **competition** is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf10. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm14. Comments:

This species is characterized by a significant annual increment of shoots to the length of 1-2 m (Krischan 2001 – I, Sołtys-Lelek and Barabasz-Krasny 2010 – P), so it can climb up trees and grow in undergrowth choking accompanying species and inhibiting regeneration of native woody plant species (Adamowski et al. 1998, Adamowski et al. 2002 – P). Thus, this species is described as a "transformer" (Balogh et al. 2005, Tokarska-Guzik et al. 2012, Bomanowska et al. 2014, Dajdok et al. 2015, Sołtys-Lelek et al. 2016, Starodubtseva et al. 2017 – P, Krzysztofiak and Krzysztofiak 2018 – A) modifying species composition of plant communities and degenerating natural habitats: tall herb fringe communities of *Adenostylion alliariae* of the montane to alpine levels and *Convolvuletalia sepium* along watercourses (code 6430) (Mierczyk-Sawicka 2018 – I), oak-hornbeam forests (code 9170), *Galio-Carpinetum* and *Tilio-Carpinetum*, aluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Pandion*, *Alnion incanae*, *Salicion albae*)(code 91E0), riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*) (code 91F0) (Tokarska-Guzik et al. 2012, Sołtys-Lelek et al. 2016 – P). According to some authors, this species also presents allelopathic properties, that is, has an adverse effect on other organisms by producing chemical substances (Csiszar 2009 – P). At a large biomass increase, it may damage trees and shrubs, at which this species climbs up, and weakens their photosynthesis (Bomanowska et al. 2014, Dajdok et al. 2015 – P). Flowers of the species are melliferous, what allows to compete for pollinators with native plant species, which are beneficent for bees (Bugała 1979, Flaga 2000 – P, Krzysztofiak i Krzysztofiak 2018 – A).

**a15**. The effect of *the species* on native species, through **interbreeding** is:

| | |
|---|---|
| **X** | no / very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf11. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm15. Comments:

There are no data on this species interbreeding with native species of plants. It should be assumed, that this will not happen in the future, especially since there are no representatives of the genus *Parthenocissus* among native species in Poland.

**a16**. The effect of *the species* on native species by **hosting pathogens or parasites** that are harmful to them is:

| | |
|---|---|
| | very low |
| **X** | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf12. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm16. Comments:

This species is a vector for the fungal pathogene *Plasmopara viticola* which attacks creepers, raspberries and blackberries, and for *Elsinoë ampelina* (Pilkington 2011 – B), which can infect native shrubby blackberries and red raspberries (Plantwise Knowledge Bank 2018 – B). *Plasmopara viticola* causes the disease known as downy mildew (Poradnik Ogrodniczy.pl 2018 – I). The studies performed in Wigry National Park demonstrate the presence of 8 species of fungi on this species, including *Botrytis cinerea*, *Alternaria alternata* and *Sclerotinia sclerotiorium* (Pusz et al. 2017 – N). All three species can attack other plants, including representatives of wild native species. However, their impact on the condition of infected plants is small and does not pose a threat to its populations

**a17**. The effect of *the species* on ecosystem integrity, by **affecting its abiotic properties** is:

| | |
|---|---|
| | low |
| **X** | medium |
| | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf13. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm17. Comments:

In case of invasion on limestone rocks, this species can slightly increase their erosion by crushing their top layer by means of tendrils rooting into rock cracks (Sołtys-Lelek and Barabasz-Krasny 2010 – P). Accelerated sliding of sandy embankments was observed as a result of excessive loading of a tree at the embankment with *P. inserta* biomass. Consequently, the tree toppled over and soil cohesion was disturbed (Krzysztofiak and Krzysztofiak 2018 – A). On stands, where *P. inserta* forms extensive carpets, conditions of light and moisture at the soil level are probably modified; however no detailed reports have been issued.

**a18**. The effect of *the species* on ecosystem integrity, by **affecting its biotic properties** is:

| | |
|---|---|
| | low |
| | medium |
| **X** | high |

| | | | | | |
|---|---|---|---|---|---|
| aconf14. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm18. Comments:

Extensive patches of dense *P. inserta* plants significantly distort abiotic properties of the ecosystem – the growth of native plant species is inhibited (Adamowski et al. 1998, 2002, 2008, Dajdok et al. 2015 – P), trees and shrubs loaded with large biomass of *P. inserta* are exposed to deformations, and even breaking of boughs or trunks are possible (Pilkington 2011 – B, Krzysztofiak and Krzysztofiak 2018 – A). Biodiversity is distorted and reduced in areas occupied by this species (Sołtys-Lelek and Barabasz-Krasny 2010, Bomanowska et al. 2014 – P), including nature reserves (Wika and Gorczyca 2006 – P) and national parks (Klasa and Sołtys-Lelek 2013, Kripluk and Bomanowska 2015, Werpachowski and Biereżnoj-Bazille 2015 – P, Krzysztofiak and Krzysztofiak 2018 – A). Some studies (Csiszar 2009 – P) indicate its weak allelopathic effects. Flowers of *P. inserta* attract many pollinators. Thus, wild bees and honeybees during the flowering period of this species are distracted from flowers of native species (Bugała 1979 – P, Krzysztofiak and Krzysztofiak 2018 – A). To sum it up, the possibility of affecting abiotic properties by this species is assessed as high.

## A4b | Impact on the cultivated plants domain

Questions from this module qualify the consequences of *the species* for cultivated plants (e.g. crops, pastures, horticultural stock).

For the questions from this module, consequence is considered 'low' when presence of *the species* in (or on) a population of target plants is sporadic and/or causes little damage. Harm is considered 'medium' when *the organism's* development causes local yield (or plant) losses below 20%, and 'high' when losses range >20%.

**a19**. The effect of *the species* on cultivated plant targets through **herbivory or parasitism** is:

| | |
|---|---|
| | inapplicable |
| **X** | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf15. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm19. Comments:

It is not a herbivore species and does not exhibit any parasitic properties.

**a20**. The effect of *the species* on cultivated plant targets through **competition** is:

| | |
|---|---|
| | inapplicable |
| | very low |
| **X** | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf16. | Answer provided with a | low | medium **X** | high | level of confidence |

| | |
|---|---|
| acomm20. | Comments:<br>This species can have allelopathic properties (Csiszar 2009 – P), but this effect on cultivated plants has not been described so far. The literature data do not describe any reports on the occurrence of *P. inserta* in crops or its competition with plants grown in gardens, fields or forest nurseries. On the other hand, the species can compete for pollinators with cultivated plants due to its melliferity. However economic aspect of this influence is not known – in this evaluation it was assessed "small", since in the blossoming period of *P. inserta* (VII – VIII), in conditions of Poland majority of plant species essential economically it is already after the blossoming period. |

**a21**. The effect of *the species* on cultivated plant targets through **interbreeding** with related species, including the plants themselves is:

| | |
|---|---|
| | inapplicable |
| | no / very low |
| **X** | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf17. | Answer provided with a | low | medium | high<br>**X** | level of confidence |

| | |
|---|---|
| acomm21. | Comments:<br>The literature contains information on interbreeding of *P. inserta* with another – related alien species – *Parthenocissus quinquefolia* (Balogh et al. 2005, Zając and Zając 2015 – P). It is difficult to classify the species of formed hybrids – no detailed description of their taxa – an can be invasive (Krzysztofiak and Krzysztofiak 2018 – A). |

**a22**. The effect of *the species* on cultivated plant targets by **affecting the cultivation system's integrity** is:

| | |
|---|---|
| **X** | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf18. | Answer provided with a | low | medium<br>**X** | high | level of confidence |

| | |
|---|---|
| acomm22. | Comments:<br>No impact on plant targets by affecting the cultivation system's integrity was documented so far. It must be assumed, that in the future the species will not be able to disturb the integrity of crops. |

**a23**. The effect of *the species* on cultivated plant targets by hosting **pathogens or parasites** that are harmful to them is:

| | |
|---|---|
| | very low |
| **X** | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf19. | Answer provided with a | low | medium<br>**X** | high | level of confidence |

| | |
|---|---|
| acomm23. | Comments:<br>This species can have a considerable effect as a vector of harmful pathogenes and parasites because it is a host to numerous species of parasitic fungi (Bennet et al. 2014 – P, Poradnik |

Ogrodniczy.pl 2018 – I, Pusz et al. 2017 – P), many of which also attack cultivated plants. Fungi pathogene *Plasmopara viticola* attacks, inter alia, grapevines, raspberries and blackberries, causing the disease known as downy mildew (CABI 2017 – B, Poradnik Ogrodniczy.pl 2018 – I), which destroys leaves and fruit of these plants. *Botrytis cinerea*, *Alternaria alternata* and *Sclerotinia sclerotiorium* (Pusz et al. 2017 – N) can attack plants cultivated by humans, such as: grapevines, potatoes, collard greens, young trees in forest nurseries and pot plants. *Botrytis cinerea* – the second important species of fungi in economic sector (Dean et al. 2012 – P), causes the disease known as grey mould. *Alternaria alternata* (Fr.) Keissl. of Dothideomycetes class causes many diseases, e.g. tan spot, and *Sclerotinia sclerotiorium* is responsible for a disease known as white mould found in over 400 species of plants (Bennet et al. 2014 – P). The mentioned species are not the EPPO list – European and Mediterranean Plant Protection Organization (EPPO).

## A4c | Impact on the domesticated animals domain

Questions from this module qualify the consequences of *the organism* on domesticated animals (e.g. production animals, companion animals). It deals with both the well-being of individual animals and the productivity of animal populations.

**a24**. The effect of *the species* on individual animal health or animal production, through **predation or parasitism** is:

| | |
|---|---|
| **X** | inapplicable |
| | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf20. | Answer provided with a | low | medium | high | level of confidence |

acomm24. Comments:
Not applicable – this species is not a parasitic plant.

**a25**. The effect of *the species* on individual animal health or animal production, by having properties that are hazardous upon **contact**, is:

| | |
|---|---|
| **X** | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf21. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm25. Comments:
Source materials do not indicate that this species has harmful properties to animals health or production.

**a26**. The effect of *the species* on individual animal health or animal production, by hosting **pathogens or parasites** that are harmful to them, is:

| | |
|---|---|
| **X** | inapplicable |
| | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf22. | Answer provided with a | low | medium | high | level of confidence |

acomm26. Comments:

This species is a plant which does not carry animal pathogenes or parasites.

## A4d | Impact on the human domain

Questions from this module qualify the consequences of *the organism* on humans. It deals with human health, being defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (definition adopted from the World Health Organization).

**a27**. The effect of *the species* on human health through **parasitism** is:

| | |
|---|---|
| **X** | inapplicable |
| | very low |
| | low |
| | medium |
| | high |
| | vert high |

| | | | | | |
|---|---|---|---|---|---|
| aconf23. | Answer provided with a | low | medium | high | level of confidence |

acomm27. Comments:

This species is not a parasitic organism.

**a28**. The effect of *the species* on human health, by having properties that are hazardous upon **contact**, is:

| | |
|---|---|
| | very low |
| | low |
| | medium |
| **X** | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf24. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm28. Comments:

Berries of *P. inserta* are poisonous for humans (they contain oxalates), and contact with skin may cause rash and sensitisation (Pilkington 2011 – I, Booy et al. 2015 – P). However the situation is not clear because some descriptions say 'not very poisonous' others ''can be deadly'. In spite of the low probability of a direct contact with fruits of *P. inserta*, the consequences of this species on human health should be assessed as high (even that there are no reports on poisoning caused by berries of *P. inserta*) (likelihood low × consequences high = impact high). However, the increased interest in herbal medicine, and thus information promoting the use of herbs can contribute to greater likelihood of poisoning by berries of *P. inserta* (inter alia, the Internet site Aga radzi has information on benefits of treatments with Virginia creeper *Parthenocissus quinquefolia*, which is very similar to thicket creeper *P. inserta*).

**a29**. The effect of *the species* on human health, by hosting **pathogens or parasites** that are harmful to humans, is:

| | |
|---|---|
| **X** | inapplicable |
| | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf25. | Answer provided with a | low | medium | high | level of confidence |

acomm29. Comments:

This species is a plant which does not carry human pathogenes or parasites.

## A4e | Impact on other domains

Questions from this module qualify the consequences of *the species* on targets not considered in modules A4a-d.

**a30**. The effect of *the species* on causing damage to **infrastructure** is:

| | |
|---|---|
| **X** | very low |
| | low |
| | medium |
| | high |
| | very high |

| | | | | | |
|---|---|---|---|---|---|
| aconf26. | Answer provided with a | low | medium | high **X** | level of confidence |

acomm30. Comments:

This species produces small twinning tips so it does not leave any traces on walls – it only grows on supports. Creepers do not cause significant structural changes of plaster (Borowski 1996b – P). The harmful influence of the species on infrastructure has not been documented so far (assessed as very low). However, its positive impact on infrastructure is described – creepers of genus *Parthenocissus* do not increase humidity, prevent the elevation from soaking during rainfall by forming an insulating layer protecting against wall heating and cooling (Borowski 1996b – P). The species can be grown on acoustic screens along highways in Poland (BUD MASZ – I). It is also used to strengthen slopes, to counteract air and soil erosion (Marczyński 2010 – I). Due to its positive impact on infrastructure (contrary to the majority of evaluated species), this fact has been included in question a05.

## A5a | Impact on ecosystem services

Questions from this module qualify the consequences of *the organism* on ecosystem services. Ecosystem services are classified according to the Common International Classification of Ecosystem Services, which also includes many examples (CICES Version 4.3). Note that the answers to these questions are not used in the calculation of the overall risk score (which deals with ecosystems in a different way), but can be considered when decisions are made about management of *the species*.

**a31**. The effect of *the species* on **provisioning services** is:

| | |
|---|---|
| | significantly negative |
| | moderately negative |
| **X** | neutral |
| | moderately positive |
| | significantly positive |

| | | | | | |
|---|---|---|---|---|---|
| aconf27. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm31. Comments:

There are no direct studies on the impact of *P. inserta* on ecosystem services – provision services. The species can indirectly influence provisioning services – producing the nectar by the species can cause pulling away insects in the period of its flowering from late blooming

plants about economic meaning (e.g. of raspberries), however this aspect requires the detailed diagnosis. At the same time a positive influence of the species is connected with the possible honey-producing; in places of mass occurrence of *Parthenocissus inserta*, it can have a potential impact for acquiring honey. Therefore influences the species for supply services was indicated as neutral.

**a32**. The effect of *the species* on **regulation and maintenance services** is:

| | |
|---|---|
| | significantly negative |
| | moderately negative |
| | neutral |
| **X** | moderately positive |
| | significantly positive |

| | | | | | |
|---|---|---|---|---|---|
| aconf28. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm32. Comments:

There are no direct studies on the impact of *P. inserta* on ecosystem services (regulation and maintenance services). However, analysing the species impact on individual components of the environment, its impact on regulation and maintenance services is assessed as moderately positive. The following elements influenced this assessment: – control of the air composition – the plant leaves absorb both particulate matter and gaseous pollutants reducing their concentrations in the air (the moderately positive assessment), – control of extreme phenomena – plants strengthen embankments, prevent the air and water erosion of soil (the moderately positive assessment).

**a33**. The effect of *the species* on **cultural services** is:

| | |
|---|---|
| | significantly negative |
| | moderately negative |
| | neutral |
| **X** | moderately positive |
| | significantly positive |

| | | | | | |
|---|---|---|---|---|---|
| aconf29. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm33. Comments:

This species is an ornament plant for groundcover purposes. This species has high ornamental values, it is used to green walls, summer houses, roofs, fences, and trellis. In autumns, its leaves become red (Tokarska-Guzik et al. 2012 – P, Zielony Front 2018 – I). In Germany, this species is used to cover sound barriers (Brandes 2012 – P), and such an application was also proposed in Poland (Muras 2016 – P). The degraded urban environment does not affect dendrometric properties of this species (Borowski 1996a – P) which has a positive impact on building elevations (Borowski 1996b – P). It is one of specially selected species of creepers to be cultivated in gardens of house estates (Szczęsny and Kimic 2012 – P). According to some sources, this species can be grown as bonsai (Rudzka 2018 – I), and it is also seldom used as an ornament plant for herbaceous bunches for sacred purposes (Fitkowski 2011 – P). This species is grown in many botanical gardens and arboreta in Poland. Its assessment as an ornament plant is lower because of too many possibilities of its uncontrolled dispersion.

## A5b | Effect of climate change on the risk assessment of the negative impact of *the species*

Below, each of the Harmonia$^{+PL}$ modules is revisited under the premise of the future climate. The proposed time horizon is the mid-21st century. We suggest taking into account the reports of the Intergovernmental Panel on Climate Change. Specifically, the expected changes in atmospheric variables listed in its 2013 report on the physical science basis may be used for this purpose. The global temperature is expected to rise by 1 to 2°C by 2046-2065.

Note that the answers to these questions are not used in the calculation of the overall risk score, but can be but can be considered when decisions are made about management of *the species*.

**a34**. INTRODUCTION – Due to climate change, the probability for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf30. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm34. Comments:

*Partenocissus inserta* has been already observed in Poland and shows local invasiveness (Tokarska-Guzik et al. 2012 – P). However, it is not cultivated on a significant scale, so further climatic changes will not affect it.

**a35**. ESTABLISHMENT – Due to climate change, the probability for *the species* to overcome barriers that have prevented its survival and reproduction in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf31. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm35. Comments:

It is the established species (Tokarska-Guzik et al. 2012 – P). Predicted climate changes are assumed not to have a significant impact on the survival rate of this species and its reproduction (no direct data on the discussed issue).

**a36**. SPREAD – Due to climate change, the probability for *the species* to overcome barriers that have prevented its spread in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf32. | Answer provided with a | low | medium **X** | high | level of confidence |

acomm36. Comments:

This species is established in Poland (Tokarska-Guzik et al. 2012 – P) and exhibits local invasiveness. Fast broadening of its occurrence range in recent years has been probably

| | |
|---|---|
| | caused by using plants to cover sound barriers (this species also improves their appearance, muffles the noise and purifies the air). A further increase in temperature and a longer vegetation period should not considerably affect the intensity of the species spread. This species may encounter a barrier of the Atlantic climate against the vitality of its seeds. The species more often propagates vegetatively (Pilkington 2011 – I). |

**a37**. IMPACT ON THE ENVIRONMENTAL DOMAIN – Due to climate change, the consequences of *the species* on wild animals and plants, habitats and ecosystems in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf33. | Answer provided with a | low | medium **X** | high | level of confidence |

| | |
|---|---|
| acomm37. | Comments:<br>It is the established species (Tokarska-Guzik et al. 2012 – P) present throughout Poland. The literature data do not describe any cases of predicting the increased negative effect of P. inserta on native species of plants and animals and on natural habitats due to further climate changes. |

**a38**. IMPACT ON THE CULTIVATED PLANTS DOMAIN – Due to climate change, the consequences of *the species* on cultivated plants and plant domain in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf34. | Answer provided with a | low | medium **X** | high | level of confidence |

| | |
|---|---|
| acomm38. | Comments:<br>The literature data do not describe any reports on the occurrence of *P. inserta* in crops. The predicted climate changes seem not to have a negative effect on cultivated plants. |

**a39**. IMPACT ON THE DOMESTICATED ANIMALS DOMAIN – Due to climate change, the consequences of *the species* on domesticated animals and animal production in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| **X** | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf35. | Answer provided with a | low | medium **X** | high | level of confidence |

| | |
|---|---|
| acomm39. | Comments:<br>*P. inserta* has no strong effect on domestic animals, except for honeybees, for which it is a quite important and periodical source of food (Flaga 2000 – P). There are also no data indicating that due to predicted global changes, this species will have any effect on farm and domestic animals. |

**a40**. IMPACT ON THE HUMAN DOMAIN – Due to climate change, the consequences of *the species* on human in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| X | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf36. | Answer provided with a | low | medium X | high | level of confidence |

acomm40. Comments:

*Partenocissus inserta* can be harmful to human health – its fruits are poisoning, and the contact with leaves may cause skin allergy. There are no data indicating that climate changes increased or reduced this impact.

**a41**. IMPACT ON OTHER DOMAINS – Due to climate change, the consequences of *the species* on other domains in Poland will:

| | |
|---|---|
| | decrease significantly |
| | decrease moderately |
| X | not change |
| | increase moderately |
| | increase significantly |

| | | | | | |
|---|---|---|---|---|---|
| aconf37. | Answer provided with a | low | medium X | high | level of confidence |

acomm41. Comments:

Taking into account occurrence sites of *P. inserta* and the species impact on other facilities, the predicted climate changes should not modify the species impact on those facilities.

## Summary

| Module | Score | Confidence |
|---|---|---|
| Introduction (questions: a06-a08) | 1.00 | 1.00 |
| Establishment (questions: a09-a10) | 1.00 | 1.00 |
| Spread (questions: a11-a12) | 1.00 | 1.00 |
| Environmental impact (questions: a13-a18) | 0.55 | 0.70 |
| Cultivated plants impact (questions: a19-a23) | 0.15 | 0.70 |
| Domesticated animals impact (questions: a24-a26) | 0.00 | 1.00 |
| Human impact (questions: a27-a29) | 0.75 | 0.50 |
| Other impact (questions: a30) | 0.00 | 1.00 |
| Invasion (questions: a06-a12) | 1.00 | 1.00 |
| Impact (questions: a13-a30) | 0.75 | 0.78 |
| Overall risk score | 0.75 | |
| Category of invasiveness | moderately invasive alien species | |

## A6 | Comments

This assessment is based on information available at the time of its completion. It has to be taken into account. However, that biological invasions are, by definition, very dynamic and unpredictable. This unpredictability includes assessing the consequences of introductions of new alien species and detecting their negative impact. As a result, the assessment of the species may change in time. For this reason it is recommended that it regularly repeated.

| | |
|---|---|
| acomm42. | Comments:<br>– |

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