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. Damian Chmura
2. Zofia Sotek
3. Maria Zając

acomm01. Comments:

	degree	affiliation	assessment date
(1)	dr hab.	Institute of Environmental Protection and Engineering, University of Bielsko-Biala	22-01-2018
(2)	dr hab.	Department of Botany and Nature Conservation, Faculty of Biology, University of Szczecin	27-01-2018
(3)	prof. dr hab.	Institute of Botany, Jagiellonian University, Kraków	01-02-2018

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

Polish name: –

Latin name: ***Persicaria perfoliata*** (L.) H. Gross

English name: Asiatic tearthumb

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:

The recommended Latin name of the species is *Persicaria perfoliata* (L.) H. Gross, 1919.

Synonyms of the Latin name: *Amplelygonum perfoliatum* (L.) Roberty and *Vautier, Chylocalyx perfoliatus* (L.) Hassk. ex Miq., *Echinocaulon perfoliatus* (L.) Hassk., *Echinocaulos perfoliatus* (L.) Meisn., *Fagopyrum perfoliatum* (L.) Raf., *Polygonum arifolium* var. *perfoliatum* L., *Polygonum perfoliatum* (L.) L., *Tracaulon perfoliatum* (L.) Greene, *Truellum perfoliatum* (L.) Soják (The Plant List 2013 - B, CABI 2018 - B).

The recommended English name: Mile-a-minute weed; Synonyms of the English name: Asiatic tearthumb, devil's tearthumb, devil's-tail tearthumb, giant climbing tearthumb (CABI 2018 - B, GBIF 2018 - I).

Polish name (synonym I)	Polish name (synonym II)
–	–
Latin name (synonym I)	Latin name (synonym II)
Chylocalyx perfoliatus	*Echinocaulon perfoliatum*
English name (synonym I)	English name (synonym II)
Fagopyrum perfoliatum	Tracaulon perfoliatum

a03. **Area** under assessment:

Poland

acomm03. Comments:

–

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

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

aconf01. Answer provided with a

low	medium	high
	X	

level of confidence

acomm04. Comments:

The species has not been yet recorded in the natural environment of Poland (Tokarska-Guzik et al. 2012 - P, Zając A. and Zając M. 2018 - B, Popiela and Łysko 2018 - B). There is no data on this species available in the databases holding the information on distribution in Poland and Central Europe. There are no reports or publications available on this subject. The species has not been found in cultivation in botanical gardens and arboretums on the territory of Poland (Botanical Garden Employees... 2018 - N). There is also no information available in Internet sources, including the websites run by plant farmers, amateurs, collectors, etc.

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
X	the domesticated animals domain
X	the human domain
X	the other domains

acomm05. Comments:

Persicaria perfoliata is a highly competitive species, which by shading other plants, may displace them from their stands (CABI 2018 - B). It can be a weed in orchards. It has a negative impact on plant nurseries, for example, trees and ornamental plants, as well as on reforestation (NPS 2009 - I). A thorny climber can make it difficult for animals to move

	around and disrupt human activities. If the species occurs in excess along roads and railways, it may impede the functioning of this infrastructure.

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:

X	low
	medium
	high

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

acomm06. Comments:

This a native species for Asia which does not occur in the countries bordering Poland. Its closest natural localities are in Far East Russia, and the secondary range - in Turkey (CABI 2018 - B, Farooq et al. 2017 - P). *Persicaria perfoliata* diasporas can theoretically get to Poland with avifauna. Birds can spread seeds of this plant over long distances (CABI 2018 - B); however, as the distance between the species' stands is long this probability is low.

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

X	low
	medium
	high

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

acomm07. Comments:

Persicaria perfoliata seeds and seedlings can be introduced to Poland accidentally, along with cuttings of ornamental plants brought to plant nurseries from the areas where this species occurs. This is likely, because living seeds can remain long in the soil (Van Clef and Stiles 2001 - P). In a similar way, i.e. with other plant material, this species has spread to the USA (EPPO 2007 - B). There is also data confirming the unintentional introduction of this plant, e.g. to North America, probably with ballast from ships (Stahl 2002 - I). Since, no such a case has been so far reported in Europe, the probability of introducing the species to the natural environment of our country is low.

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

X	low
	medium
	high

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

acomm08. Comments:

There is no data confirming the introduction of *Persicaria perfoliata* to the areas located

beyond the natural range as a result of intentional human activities. It is unlikely that this plant will be intentionally imported to Poland. It is not an ornamental, cultivated species. There is no data confirming cultivation of this species in botanical gardens, arboretums, etc. (Botanical Garden Employees... 2018 - N).

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:

Persicaria perfoliata occurs in various climatic conditions. Its range of appearance is wide; it is considered a temperate species with subtropical tendencies (Okay 1999 - B). It is able to tolerate a wide range of temperature and humidity (CABI 2018 - B). Cold winters and hot, wet summers are not a limiting factor for the species. In a humid, warm climate, it can adopt to undergo an entire life cycle (CABI 2018 - B). In a temperate climate it occurs in the secondary range. Both in the native (China) and invasive (USA) range there are places where *Persicaria perfoliata* occurs in climatic conditions whose similarity to Poland is in the range of 94-100%. This means that there are optimal conditions for establishment in Poland. The nearest alien stands are in Turkey and are characterized by a similarity in the range of 45-94%, and thus they are beneficial for establishment. A large part of the species' stands in the native range is within the range of 0-45% of the climatic similarity. These are the areas of south-east Asia (southern China, Indonesia). Taking into account all climate models, Poland is among the risk countries for invasion of this species (EPPO 2007 - B).

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:

Habitat conditions in Poland are suitable for the establishment of *Persicaria perfoliata*. It is a ruderal plant, growing living on the roadside, wasteland, fallow land, along the railway lines, but also on the edges of forests and brushwood, in riverside habitats, meadows and grassy slopes (CABI 2018 - B). It usually enters open and disturbed habitats (Oliver 1996 - P, Wu et al. 2002 - P). It has great adaptability and grows on soils having different structure and pH, from alkaline to acidic (CABI 2018 - B). At low pH (pH 3.5) the seeds do not require stratification (Kumar and Di Tommaso 2005 - P). It usually occurs in habitats with a large amount of bedding on the soil (Okay 1999 - B).

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
X	high
	very high

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

acomm11. Comments:

Data type B - population expansion - the species has not yet been found in the natural environment of Poland, but if it reached our country, the rate of its expansion could be similar to that in North America. Its rate of spread is quite fast. It was found that over 55 years the species covered the distance of 500 km in different directions (Kumar and DiTommaso 2005 - P). It can be assumed that when the species gets into Poland it can also become highly invasive and quickly spread through zoochory (seeds spread by animals).

Data type C - tThe ability to spread without the human participation can be evaluated based on the biological assessment of species mobility. The ability to adopt to a wide range of temperatures and humidity, long viability of seeds in the soil (Van Clef and Stiles 2001 - P), the possibility of sprouting at different temperatures (4.4-20°C) (Yang and Kim1993 - P, McCormick and Johnson 1997 - P, according to Wu et al. 2002 - P) and rapid shoot growth (EPPO 2007 - B) promote the introduction and relatively rapid spread of *Persicaria perfoliata*. Greater reproductive capacity of *Persicaria perfoliata* in the area of secondary range compared to the natural range and the lack of herbivorous oligophagous and monophagous species i.e. those whose diet is restricted to few or only one food in North America can cause strong invasiveness of the species on the east coast of this continent (Guo et al. 2011 - P, Cutting and Hough-Goldstein 2013 - P). This species also has the ability to grow vegetatively, because roots grow in the stem nodes and new plants producing flowers and fruits develop (Wu et al 2002 - P). The plant can spread in many ways. Diasporas can be disseminated, among others, via water, birds, deer, squirrels and ants (NPS 2009 - I). In the USA, birds are responsible for spreading of this species over long distances (CABI 2018 - B, O'Rourke and Lysaght 2014 - B).

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

	low
X	medium
	high

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

acomm12. Comments:

If *Persicaria perfoliata* gets into Poland, human can unconsciously introduce it by transferring seeds on clothing and equipment used, e.g. to mow, as in the areas in which it already occurs (EPPO 2007 - B). Because it is a ruderal plant, it could easier spread to anthropogenic habitats. There is no basis for considering the intended human activities to be involved in the spread of the species, because it is not used in horticulture or other sectors of the economy. The species could be intentionally introduced only in the case of

	cultivation for healing purposes (the plant has long been used in the native range in natural medicine, CABI 2018 - B).

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 herbivory is**:

X	inapplicable
	low
	medium
	high

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

acomm13. Comments:

The species is not a parasitic plant.

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:

Persicaria perfoliata is a highly competitive plant. It has the ability to self-pollinate and does not have to compete with other plant species for pollinators. The seeds sprout in early spring (Wu et al. 2002 - P), at low temperatures, which makes it more competitive with other plants sprouting later, at higher soil temperatures (Kumar and DiTommaso 2005 - P). Early sprouting of seeds and rapid growth of *Persicaria perfoliata* (even up to 15 cm per day) (Stahl 2002 - I) causes that in a short time it is able to shade and "dominate" other species of plants. Due to of its heavy weight creeper climbing on other plants, bushes and trees can cause mechanical damage (GISD 2018 - B). The plant can spread in various ways. It also has the ability to grow vegetatively, because roots grow in the stem modes and new plants producing flowers and fruits develop (Wu et al. 2002 - P). Given the above-mentioned features of *Persicaria perfoliata* we can assume that it will be just as competitive after reaching Poland.

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 **X**	medium	high	level of confidence

acomm15. Comments:

There is very little data available on this issue. There is information that it interbreeds only occasionally (CABI 2018 - B).

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:

Persicaria perfoliata is attacked by the *Glomerell cingulata* fungus, causing gangrene, but the species is not included in the EPPO quarantine lists (Najberek et al. in preparation - N). This fungus is a parasite of many plants among others it causes apple disease, *Glomerella* leaf spot.

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:

Due to the intensive development after getting to Poland *Persicaria perfoliata* may restrict the access of other plants to the nutrients accumulated in the soil, as well as to light, and this will reduce photosynthetic efficiency (EPPO 2007 - B). Since it is a plant that primarily colonizes anthropogenic habitats (see question a10), it can be assumed that the species will cause hard-to-reversible changes in the processes typical of non-special care habitats, or easily reversible changes in the processes that occur in habitats of particular concern.

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

	low
X	medium
	high

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

acomm18. Comments:

Owing to strong competitive traits, *Persicaria perfoliata* can affect the integrity of the ecosystem by disturbing its biotic factors. The plant begins its vegetative season early and grows quickly, in this way it may dominate other species and, consequently, weaken their development (see question a14). It may limit the number of these species, and in extreme cases displace them from the habitat. Under favourable circumstances, *Persicaria perfoliata* becomes dominant. Its dense climber with thorns can make it difficult for animals to move

around in their natural environment (CABI 2018 - B, EPPO 2007 - B). Since it is a plant that primarily colonizes anthropogenic habitats (see question a10), it can be assumed that the species will cause hard-to-reversible changes in the processes typical of non-special care habitats, or easily reversible changes in the processes that occur in habitats of particular concern.

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:

The species is not a parasitic plant.

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

	inapplicable
	very low
	low
X	medium
	high
	very high

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

acomm20. Comments:

Persicaria perfoliata is not a typical agricultural crop weed but it disrupts fruit cultivation (CABI 2018 - B) by competing for light and nutrients. It can cause losses in orchards, gardens and forest plantations, as well as hinder forestation because climbing on plants and covering them, it limits their access to the light. In the USA, for example, a Christmas tree plantation was damaged (NPS 2009 - I).The effects of species occurrence in crops are huge, but taking into account the low probability of plant colonization in arable areas, the impact can be considered as medium.

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

	inapplicable
X	no / very low
	low
	medium

	high
	very high

aconf17.	Answer provided with a	low **X**	medium	high	level of confidence

acomm21. Comments:

There is very little data available on this issue. The information on occasional interbreeding lacks the names of species with which *Persicaria perfoliata* interbreeds (Okay 1997 - B, CABI 2018 - B).

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

	very low
	low
X	medium
	high
	very high

aconf18.	Answer provided with a	low	medium **X**	high	level of confidence

acomm22. Comments:

In the case of absence of *Persicaria perfoliata* removal from the crop, this species will impair its integrity. However, if appropriate treatments and chemical plant protection products are used systematically, this phenomenon should not occur (Kumar and DiTommaso 2005 - P). A mass spread of the species in orchards, gardens, plant nurseries and forest plantations may also disrupt crop integrity, because it weakens tree seedlings (EPPO 2007 - B). Taking into account the scale of the species's impact and the effectiveness of protective treatments, the impact of the plant can be considered as medium.

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

X	very low
	low
	medium
	high
	very high

aconf19.	Answer provided with a	low	medium **X**	high	level of confidence

acomm23. Comments:

The species was not identified as a vector of pathogens or parasites that put crops in danger.

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:

The species is a plant.

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

	very low
X	low
	medium
	high
	very high

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

acomm25. Comments:

Sharp thorns on the stems, petioles and main nerves of the creeper leaves (Hill et al. 1981 - P) hinder the movement of animals, may cause wounds, just like in wild animals moving in their natural environment (Okay 1997 - B, EPPO 2007 - B).

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:

The species is not a parasitic plant, it does not carry pathogens or parasites that put animals in danger.

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:

The species is not a parasitic plant.

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

X	very low
	low
	medium
	high
	very high

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

acomm28. Comments:

The species does not pose a threat to human life and health. Furthermore, it has been used in Chinese medicine for about 300 years (Yang and Kim 1993 - P). The fruits are also edible. *Persicaria perfoliata* leaves, petioles and stems contain thorns which may make it difficult for people to move in forests and recreation places where the species occurs (CABI 2018 - B).

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:

The species does not carry pathogens or parasites that are dangerous to humans.

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:

	very low
X	low
	medium
	high
	very high

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

acomm30. Comments:

The species occurs in excess along roads and railways which may impede the functioning of the infrastructure. The formation of thick bushes of thorny climbers on the banks of watercourses used for recreational purposes may make it difficult for people to relax, and fish.

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
X	moderately negative
	neutral
	moderately positive
	significantly positive

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

acomm31. Comments:

Having the negative impact on forest crops, *Persicaria perfoliata* limits the development of trees, and thus reduces the supply of wood. However, in its natural range the species has long been used as a herbal medicament in Chinese folk medicine (Yang and Kim 1993 - P). Some chemical compounds isolated from the plant may be used in medicine as natural antioxidants (Chang et al. 2008 - P), including anti-cancer agents (Boadi et al. 2003 - P, Pietruck et al. 2003 - P).

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

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

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

acomm32. Comments:

No data is available in this regard. *Persicaria perfoliata* seems not to significantly affect recreational services as it was not reported to transform the abiotic environment, disturb the cycles of elements circulation or cause soil erosion. Owing to it is a self-pollinating plant, it will not compete for pollinators, but in the case of excess of the species it may hinder pollination, spread of seeds of other plants and reduce nutrients and ightlight availability.

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

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

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

acomm33. Comments:

Thick *Persicaria perfoliata* brushwood growing on the banks of rivers and streams cause that they cannot be used for recreational purposes. In excess, the species can have

a negative impact on landscape aesthetics. In the secondary range, like the United States, *Persicaria perfoliata* spreads to recreational areas, such as Rock Creek Park near Washington (Fleming and Kanal 1992 - P). The thorny brushwood is bothersome for tourists.

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:

The climate change in Poland will probably not have an influence on crossing of geographical barriers by this species, as it happens in both temperate and tropical climate. It is able to tolerate a wide range of temperatures and humidity (Zheng et al. 2005 - P). The scenarios of climate change and the possibility of creating potential niche by the species indicate that the majority of Europe is under threat; however this threat is already visible based on the analysis of the climate in native range of the species (EPPO 2007 - B).

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:

The climatic conditions are probably not a barrier preventing the species from surviving and reproducing in Poland, but it cannot be concluded until the *Persicaria perfoliata* is introduced to Central Europe. The climate change in Poland will probably not affect the establishment of the species.

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:

The climate change will probably not allow *Persicaria perfoliata* to cross the barriers that have so far enabled the species to spread in Poland. If the humidity increased in parallel, it could have an impact on increase of the probability of the species spread in the country. (O'Rourke and Lysaght 2014 - B),.

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:

The anticipated climate change will probably not alter the impact of the species on wild plants and animals as well as habitats and ecosystems.

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:

The anticipated climate changes will probably not alter the impact of the species on cultivated crops and thus crop production.

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:

The climate change would probably have no impact on the influence of *Persicaria perfoliata* on livestock and domestic animals, as well as on animal production in Poland, because the species, both in the primary and secondary range, under various climatic conditions, does not have a significant impact on 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:

The plant does not have a significant impact on humans and the anticipated climate changes will not alter the impact of the species on humans.

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 **X**	medium	high	level of confidence

acomm41. Comments:

The anticipated climate change will probably not alter the impact of the species on other objects (no direct data is available in this respect).

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	0.00	0.50
Establishment (questions: a09-a10)	1.00	0.50
Spread (questions: a11-a12)	0.63	0.50
Environmental impact (questions: a13-a18)	0.45	0.50
Cultivated plants impact (questions: a19-a23)	0.20	0.60
Domesticated animals impact (questions: a24-a26)	0.25	0.50
Human impact (questions: a27-a29)	0.00	0.50
Other impact (questions: a30)	0.25	0.50

Invasion (questions: a06-a12)	0.54	0.50
Impact (questions: a13-a30)	0.45	0.52
Overall risk score	0.24	
Category of invasiveness	potentially 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:

Persicaria perfoliata has not been yet found in the natural environment of Poland or other European countries. However, it occurs in the EPPO region, where its distribution is limited. It spreads quickly in North America where it is considered a highly invasive species (EPPO 2008 - B). The assessment of *Persicaria perfoliata* in terms of invasiveness risk for Poland resulted in qualification of the species to the category - "a potentially invasive alien species". The highest score (0.45) was obtained in the module "Impact on the natural environment" (questions a13-a18). This result is likely to be associated with its significant advantage over co-existing species, the lack of natural enemies in the secondary range and the negative impact on the integrity of settled ecosystems (a high negative impact on biotic factors and medium impact on abiotic factors).

Even though the species was not reported in Poland, the conviction that it is a potential threat to most European countries, including Poland, led to its inclusion in the EPPO List A2 (2017-09 version). The experience of countries in which the species is established indicates that the appropriate preventive measures should be early taken, including education of societies and relevant services, making them aware of the strength and consequences of invasiveness of the species and the routes of introduction. After potential unintentional introducing of this species to the Polish territory, its stands should be eliminated as soon as possible.

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