



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. Wojciech Adamowski
2. Monika Myśliwy – external expert
3. Zygmunt Dajdok

acomment01.	Comments:	degree	affiliation	assessment date
		(1) dr	Białowieża Geobotanical Station, Faculty of Biology, University of Warsaw	15-01-2018
		(2) dr	Department of Plant Taxonomy and Phytogeography, Faculty of Biology, University of Szczecin	26-01-2018
		(3) dr	Department of Botany, Institute of Environmental Biology, University of Wrocław	31-01-2018

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

Polish name: Niecierpek pomarańczowy
Latin name: ***Impatiens capensis*** Meerb.
English name: Orange balsam

acomm02.

Comments:

The nomenclature was adapted after Mirek et al. (2002 – P). Latin name is widely accepted (The Plant List 2013 – B).

Synonyms of the Latin name: *Balsamina capensis* (Meerb.) DC., *Balsamina fulva* Ser., *Chrysaea biflora* (Walter) Nieuwl. & Lunell, *Impatiens biflora* Walter, *Impatiens fulva* Nutt., *Impatiens maculata* Muhl., *Impatiens noli-tangere* ssp. *biflora* (Walter) Hultén

A synonym of the Polish name: niecierpek przylądkowy

Synonyms of the English name: orange jewelweed, spotted touch-me-not

Polish name (synonym I)
niecierpek przylądkowy

Polish name (synonym II)
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Latin name (synonym I)
Impatiens biflora

Latin name (synonym II)
Impatiens fulva

English name (synonym I)
Common jewelweed

English name (synonym II)
Spotted jewelweed

a03. Area under assessment:

Poland

acomm03.

Comments:

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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
- alien, present in Poland in the environment, established

aconf01.

Answer provided with a

low

medium

high

X

level of confidence

acomm04.

Comments:

The occurrence of *Impatiens capensis* in the area of Poland was first confirmed in 1987 (Pawlaczyk and Adamowski 1991 – P). A literature review supplemented with field research performed in 2017 indicates its continuous spread (Zajęc et al. 1993, Ziarnek 1997, Zajęc A. and Zajęc M. 2001 – P, Hryniewicz 2008 – N, Myśliwy et al. 2009 – P, Bosiacka and Wilhelm 2014 – N, Popiela et al. 2015 – P, Adamowski and Myśliwy 2017 – N). This species has the status of a kenophyte (= neophyte) in Poland (Tokarska-Guzik 2005 – P). In 2012, it was included in the group of alien, locally established and invasive species (Tokarska-Guzik et al. 2012 – P). Up to date, orange balsam has been present only in the area of Szczecin Lagoon (Popiela et al. 2015 – P, Adamowski i Myśliwy 2017 – N).

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

- the environmental domain
- the cultivated plants domain
- the domesticated animals domain
- the human domain
- the other domains

acomm05.

Comments:

It is estimated that orange balsam *Impatiens capensis* is less invasive than Himalayan balsam *Impatiens glandulifera* and small balsam *Impatiens parviflora*. Its lesser expansion in Europe may be associated with a much less frequent occurrence in cultivation (Matthews et al. 2015 – P). Experimental data indicate the possibility of displacing native touch-me-not

balsam *Impatiens noli-tangere* by *Impatiens capensis* (Skálová et al. 2012, 2013 – P). There is also at least a theoretical possibility of interbreeding between these two species. However, so far in Europe *Impatiens capensis* rarely coexists with *Impatiens noli-tangere*, there are also no confirmed data on the occurrence of hybrids (Preston et al. 2002, Tabak and von Wettberg 2008 – P). Competition with native plant species for pollinators because of the nectar rich in sugars and amino acids (Rust 1977, Lanza et al. 1995 – P) and allelopathic effects, similarly to other species of *Impatiens* are likely (Vrchotová et al. 2011 – P). In North America *Impatiens capensis* is often attacked by *Puccinia recondita* rust (Koslov and Clay 2010 – P). In Poland, rusts of this group attack cereals (Grzesik and Strzembicka 2003, Weber et al. 2015 - P). There is a risk that the expansion of *Impatiens capensis* will increase the severity of cereal infestation by this rust. Because of its mass occurrence on the banks of watercourses and bodies of water *Impatiens capensis* may intensify erosion in the autumn and winter season, similarly to the case of *Impatiens glandulifera* (Greenwood and Kuhn 2014 – P). This species enters protected natural habitats, e.g. into 6430-3 habitat: lowland, riverside fringe communities, reaching high coverage in certain habitats (Myśliwy 2011, 2017 – A). Determination of the impact of *Impatiens capensis* on the diversity of plots of protected herbaceous vegetation requires long-term research on permanent plots.

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 Polish territory is:

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

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

acommm06. Comments:
Impatiens capensis is already established in Poland, so the probability of its appearance as a result of self-propelled expansion is high, with a high level of confidence (see instructions for the *Harmonia*^{PL} questionnaire). This species is present in Poland in the area of Szczecin Lagoon (Popiela et al. 2015 – P, Adamowski and Myśliwy 2017 – N), as well as in north-eastern Germany in the vicinity of the German part of the Szczecin Lagoon (FloraWeb 2018 – B). It is currently listed in 8 European countries, mostly as established (Matthews et al. 2015 – P, DAISIE 2018, Q-Bank 2018, Manual of the Alien Plants of Belgium 2018 – B). It expands as a result of spreading seeds ejected from explosively-breaking capsules (fruits) - this process is called autochory. The seeds ejected from the capsules can be further disseminated by water (so-called hydrochory), and less frequently by wind (so-called anemochory) (Matthews et al. 2015 – P).

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

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

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

acomm07.

Comments:

Impatiens capensis is already established in Poland, so the probability of its appearance as a result of unintentional human action is high, with a high level of confidence (see instructions for the *Harmonia*^{+PL} questionnaire). This species is present in Poland in the area of Szczecin Lagoon (Popiela et al. 2015 – P, Adamowski and Myśliwy 2017 – N), as well as in the vicinity of the German part of the Szczecin Lagoon (FloraWeb 2018 – B). The authors of the first report on *Impatiens capensis* sites in Poland do not exclude the possibility of accidental introduction of diaspores (e.g. on boats, in ballast waters of ships) (Pawlaczyk and Adamowski 1991 – P, Gatunki obce w Polsce [Alien species in Poland] 2018 – B).

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

- low
- medium
- high

aconf04.

Answer provided with a

low	medium	high
		X

level of confidence

acomm08.

Comments:

Impatiens capensis is already established in Poland, so the probability of its appearance as a result of intentional human action is high, with a high level of confidence (see instructions for the *Harmonia*^{+PL} questionnaire). Orange balsam was introduced to Europe probably as an ornamental plant, and then "escaped" from cultivation (Adamowski 2008 – P). This species is present in Poland in the area of the Szczecin Lagoon (Popiela et al. 2015 – P, Adamowski and Myśliwy 2017 – N), in the vicinity of the German part of the Szczecin Lagoon (FloraWeb 2018 – B), as well as in many Western European countries frequently visited by Polish people (Matthews et al. 2015 – P, DAISIE 2018 – B). Orange balsam has attractive flowers and can be imported for ornamental purposes, because of its melliferous properties (Rust 1977, Lanza et al. 1995 – P), as well as because of purported medicinal properties (Long et al. 1997, Motz et al. 2015 – P). Seeds are not available in Poland (Mackiewicz 2015 – I), but they can be purchased on-line (Etsy 2018, LocalHarvest 2018, ebay 2018 – I). It can be assumed that the trade of this species will not develop on a mass scale because of legal regulations – *Impatiens capensis* is among 16 plants listed in the "Regulation of the Minister of the Environment of 9 September 2011 on the list of plants and animals of alien species, that could be a threat to native species or natural habitats in case of their release into the natural environment" (Regulation...2011 – P). In addition, this species is listed in the "Code of good practice in horticulture" prepared by the General Directorate for Environmental Protection in the group of plants prohibited for cultivation due to the above-mentioned legal regulations. However, actions should be taken to disseminate knowledge about the code itself, as well as the objectives of its preparation and assumed implementation effects.

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 a **climate** that is:

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

aconf05.	Answer provided with a	low	medium	high X	level of confidence
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acomment09. Comments:
Impatiens capensis is already established in Poland, so the climatic conditions are optimal for its establishment, with a high level of confidence (see instructions for the *Harmonia*^{+PL} questionnaire). The species is an annual plant, present in Poland for approximately 30 years (Pawlaczyk and Adamowski 1991 – P) and constantly expanding in distribution (Zajac A. and Zajac M. 2001, Myśliwy et al. 2009, Popiela et al. 2015 – P, Adamowski and Myśliwy 2017 – N). After intentional introduction, orange balsam has been expanding in distribution in southern Finland for 70 years (Krögerus 1977 – P, Kasviatlas 2018 – B), in climatic conditions similar to those prevailing in north-eastern Poland (Klimadiagramme weltweit 2018 – B). Skálová et al. (2011 – P) did not find any impediments to the establishment of *Impatiens capensis* in Czech climatic conditions, nor did Matthews et al. (2015 – P) in the climatic conditions of the Netherlands.

a10. Poland provides **habitat** that is

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

aconf06.	Answer provided with a	low	medium	high X	level of confidence
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acomment10. Comments:
Impatiens capensis is already established in Poland, so the habitat conditions are optimal for its establishment, with a high level of confidence (see instructions for the *Harmonia*^{+PL} questionnaire). This species in its natural range (east of the United States and south-east of Canada) occurs in humid forests of the temperate zone and on the banks of watercourses and bodies of water (Gleason and Cronquist 1991 – P, Weakley 2015 – I). In Poland, favourable conditions occur in large areas, and orange balsam has been observed in similar habitats to its natural range (banks of watercourses and bodies of water, humid forests; Pawlaczyk and Adamowski 1991, Torbé 2000, Myśliwy et al. 2009 – P), as well as in humid ruderal habitats (Adamowski and Myśliwy 2017 – N). *Impatiens capensis* has similar habitat requirements to *Impatiens glandulifera*. Under experimental conditions the survival of orange balsam did not decrease under the influence of over-drying and flooding. An increase in the content of nutrients in the soil affected this species negatively, while shading and decrease in the content of nutrients affected it positively (Skálová et al. 2012 – P).

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
- very high

aconf07.	Answer provided with a	low	medium	high X	level of confidence
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a12.11. Comments:

Data related to the expansion from a single source (type A data): the range of autochorous seed dissemination is at least 1.8-2.2 m (Schmitt et al. 1985, Hayashi et al. 2009 – P). The seeds can be transported over long distances along the course of watercourses and by currents and waves on reservoirs, remaining on the water surface for over 200 days (Tabak and Von Wettberg 2008, Matthews et al. 2015 – P), and over short distances probably also epizoochorically and analogously with the case of *Impatiens glandulifera* endozoochorically in the gastrointestinal tracts of fish (Boedeltje et al. 2015 – P). In Great Britain *Impatiens capensis* has proved to be the slowest expanding species of *Impatiens* among the three species examined (*Impatiens capensis*, *Impatiens glandulifera*, *Impatiens parviflora*; Perrins et al. 1993 – P). In the Netherlands it has expanded to a considerable extent in a period slightly longer than 20 years (Matthews et al. 2015 – P).

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

<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input checked="" type="checkbox"/>	high

aconf08.	Answer provided with a	low	medium	high X	level of confidence
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a12.12. Comments:

The introduction of *Impatiens capensis* to new sites has been legally prohibited (The Regulation... 2011 – P). Because of its attractive flowers and potential melliferous properties (Rust 1977, Lanza et al. 1995 – P), intentional dissemination of this species by humans cannot be excluded – seeds are available on-line (Etsy 2018, LocalHarvest 2018, ebay 2018 – I). An important role in the expansion of the species can be also played by unintentional transfer of seeds in ballast waters (Gatunki obce w Polsce [Alien species in Poland] 2018 – B) or with soil. The authors of the first observation of *Impatiens capensis* in Poland (Pawlaczyk and Adamowski 1991 – P) emphasized a probable relationship between the vicinity of the shipping fairway connecting Świnoujście with Szczecin and first sites of this species in the surroundings of adjacent village of Trzebież. Further unintentional introductions are not excluded.

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:

<input checked="" type="checkbox"/>	inapplicable
<input type="checkbox"/>	low

- medium
- high

aconf09. Answer provided with a

low	medium	high
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 level of confidence

acomm13. Comments:
Impatiens capensis is a green plant, which nourishes itself autotrophically.

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

- low
- medium
- high

aconf10. Answer provided with a

low	medium	high X
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 level of confidence

acomm14. Comments:
Experimental data indicate the possibility of displacing native *Impatiens noli-tangere* by *Impatiens capensis* (Skálová et al. 2013 – P), however its impact is assessed as weaker in comparison with the threats posed to *Impatiens noli-tangere* by other non-native species of *Impatiens* (Matthews et al. 2015 – P). Competition with native plant species for pollinators because of the nectar rich in sugars and amino acids produced by *Impatiens capensis* (Rust 1977, Lanza et al. 1995 – P) is probable. In contrast with the statement of Matthews et al. (2015 – P), concerning the lack of formation of monocultures by this species, in Poland its occurrence in the tall herb fringe communities of the order *Convolvuletalia sepium*, in which it often achieves a significant coverage, co-dominating in plots with *Impatiens glandulifera* and even forming its own plant community, has been observed (Myśliwy 2011, 2017 – A). The score of the effect has been increased because of the expansion of *Impatiens capensis* into habitats of particular concern, which are also often intruded by other invasive species (*Impatiens glandulifera*, *Echinocystis lobata*) and the possible cumulation of their effects. This problem should be a subject of special long-term research.

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

- no / very low
- low
- medium
- high
- very high

aconf11. Answer provided with a

low	medium X	high
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 level of confidence

acomm15. Comments:
There is at least a theoretical possibility of interbreeding of *Impatiens capensis* with *Impatiens noli-tangere*, as they have the same number of chromosomes (CCDB 2018 – B) and are phylogenetically related (Yu et al. 2015 - P). However, so far in Europe *Impatiens capensis* rarely coexists with *Impatiens noli-tangere*; there are also no confirmed data on the occurrence of hybrids (Preston et al. 2002, Tabak and von Wettberg 2008 – P).

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

- very low
- low
- medium
- high
- very high

aconf12. Answer provided with a

low	medium X	high
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 level of confidence

acomm16. Comments:
Podospaera balsaminae has been reported on *Impatiens capensis* in Great Britain (Encyclopaedia of Life 2018 – B), in Poland it is a known parasite of *Impatiens noli-tangere* (Kozłowska et al. 2015 – P). This species under the alternative name of *Sphaerotheca balsaminae* was first reported in Poland on *Impatiens capensis* by Mutenko (1994 – P). The presence of pathogens with a wider spectrum of hosts on orange balsam cannot be excluded, which in case of its expansion throughout Poland could contribute to the dissemination of these pathogens.

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

	low
	medium
X	high

aconf13. Answer provided with a

low	medium X	high
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 level of confidence

acomm17. Comments:
Impatiens capensis, as a species with smaller competitive abilities in comparison with *Impatiens glandulifera* and *Impatiens parviflora*, is often not treated as a problematic species (Tabak and Von Wettberg 2008 – P). Some sources report that this species does not form dense monocultures (Tabak and Von Wettberg 2008, Matthews et al. 2015 – P), which could significantly compete for space and light with native plant species. However, the latest observations from Poland (Myśliwy 2011, 2017 – A) confirm the view of Winsor (1983 – P) concerning the domination of the habitat by simultaneously and early growing seedlings of this species. The observed coverage of *Impatiens capensis* in plots of herbaceous vegetation and in ground cover may reach 70-100% (Myśliwy 2011, 2017 – A), which may affect the abiotic conditions of the ecosystem by strong shading or increased erosion, as well as increase the probability of allelopathic interactions (Vrchotová et al. 2011 – P), associated with the release of substances inhibiting the development of other plants into the soil. The score of this effect has been increased due to the lack of unambiguous data concerning the reversibility of changes caused by the species.

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 X	high
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 level of confidence

acomm18. Comments:
Competition of *Impatiens capensis* with native plant species for pollinators because of the nectar rich in sugars and amino acids (Rust 1977, Lanza et al. 1995 – P) and allelopathic effects, similarly to other species of *Impatiens* are likely (Vrchotová et al. 2011 – P). Up to date (Tabak and von Wettberg 2008, Matthews et al. 2015 – P), the levels of occurrence of this species which would cause monopolization of the resources have not been observed (however see Winsor 1983 – P), but observations of small vegetation patches, in which the participation of *Impatiens capensis* in their coverage was 70-100% (Myśliwy 2011, 2017 – A) indicates the possibility of the occurrence of such a phenomenon should the species expand throughout Poland.

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
- very low
- low
- medium
- high
- very high

aconf15. Answer provided with a

low	medium	high X
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 level of confidence

acomm19. Comments:
Impatiens capensis is a green plant, which nourishes itself autotrophically.

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

- inapplicable
- very low
- low
- medium
- high
- very high

aconf16. Answer provided with a

low	medium	high X
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 level of confidence

acomm20. Comments:
No data on the mass occurrence of *Impatiens capensis* in areas of cultivations was found in the literature (Matthews et al. 2015 – P).

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

- inapplicable
- no / very low
- low
- medium
- high
- very high

aconf17. Answer provided with a

low	medium	high X
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 level of confidence

acomm21. Comments:
There is at least a theoretical possibility of interbreeding of *Impatiens capensis* with *Impatiens noli-tangere*, as they have the same number of chromosomes (CCDB 2018 – B) and are phylogenetically related (Yu et al. 2015 – P). However, so far in Europe *Impatiens capensis* rarely coexists with *Impatiens noli-tangere*, there are also no confirmed data on the occurrence of hybrids (Preston et al. 2002, Tabak and von Wettberg 2008 – P). No data on the interbreeding of *Impatiens capensis* with cultivated plants was found in the literature (Matthews et al. 2015 – P).

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

- very low
- low
- medium
- high
- very high

aconf18. Answer provided with a

low	medium	high X
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 level of confidence

acomm22. Comments:
No data on the mass occurrence of *Impatiens capensis* in areas of cultivations was found in the literature (Matthews et al. 2015 – P).

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

- very low
- low
- medium
- high
- very high

aconf19. Answer provided with a

low	medium X	high
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 level of confidence

acomm23. Comments:
In the natural range, infestation of *Impatiens capensis* by the fungus *Puccinia recondita* is often observed (Koslov and Clay 2010 – P). Fungi of this group attack cereals in many countries, including Poland (Grzesik and Strzembicka 2003, Weber et al. 2015 – P). However, it is not known whether forms of *Puccinia recondita* infesting cereals in Poland are able to infest orange balsam – this problem requires research. If so, in the case of expansion of orange balsam throughout Poland, the intensification of cereal infections caused by this pathogen, leading to economic loss, is possible. A water mould called *Plasmopara obducens* observed on *Impatiens capensis* (Encyclopaedia of Life 2018 – B) has expanded rapidly throughout the world over the past dozen or so years, attacking the frequently cultivated *Impatiens walleriana* (Choi et al. 2009, Harlan et al. 2011, Bulajic et al. 2011 – P). However, a recent systematic revision (Görg et al. 2017 – P) has revealed that the pathogen of *Impatiens walleriana* belongs to a separate species called *Plasmopara destructor*.

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:

- inapplicable
- very low
- low
- medium
- high
- very high

aconf20. Answer provided with a

low	medium	high
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 level of confidence

acomm24. Comments:
Impatiens capensis is a green plant, which nourishes itself autotrophically.

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

- very low
- low
- medium
- high
- very high

aconf21. Answer provided with a

low	medium	high X
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 level of confidence

acomm25. Comments:
No data indicating animal health hazard in the case of a direct contact with *Impatiens capensis* was found in the literature (Matthews et al. 2015 – P).

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

- inapplicable
- very low
- low
- medium
- high
- very high

aconf22. Answer provided with a

low	medium	high
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 level of confidence

acomm26. Comments:
Impatiens capensis does not host any pathogens or parasites which are harmful for animals (Matthews et al. 2015 – P).

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:

- inapplicable
- very low
- low
- medium
- high
- vert high

aconf23. Answer provided with a

low	medium	high
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 level of confidence

acomm27.

Comments:

Impatiens capensis is a green plant, which nourishes itself autotrophically.

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

- very low
- low
- medium
- high
- very high

aconf24.

Answer provided with a

low	medium	high X
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level of confidence

acomm28.

Comments:

No data indicating human health hazard in the case of a direct contact with *Impatiens capensis* was found in the literature (Matthews et al. 2015 – P).

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

- inapplicable
- very low
- low
- medium
- high
- very high

aconf25.

Answer provided with a

low	medium	high X
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level of confidence

acomm29.

Comments:

Impatiens capensis is a green plant and does not host any pathogens or parasites which are harmful for humans (Matthews et al. 2015 – P).

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
- low
- medium
- high
- very high

aconf26.

Answer provided with a

low	medium X	high
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level of confidence

acomm30.

Comments:

Up to date, no harmful direct effect of orange balsam on infrastructure has been reported (Matthews et al. 2015 – P). However, observations of small vegetation patches, in which the participation of orange balsam in their coverage was 70-100% (Myśliwy 2011, 2017 – A) indicates the possibility of such effect (plugging of culverts, weakening of embankments) should the species expand throughout Poland, especially on the banks of watercourses exposed to erosion. The mass occurrence on the banks of watercourses may theoretically cause their erosion in the autumn and winter season, similarly to the case of

Himalayan balsam *Impatiens glandulifera* (Greenwood and Kuhn 2014 – P). In the case of drainage ditches or ducts supplying water to e.g. ponds, this process may involve the necessity of additional costs for their maintenance.

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
- neutral
- moderately positive
- significantly positive

aconf27. Answer provided with a

low	medium	high
	X	

 level of confidence

acomm31. Comments:
In the natural range, the infestation of *Impatiens capensis* by the fungus *Puccinia recondita* is often observed (Koslov and Clay 2010 – P). Fungi of this group attack cereals in many countries, including Poland (Grzesik and Strzembicka 2003, Weber et al. 2015 – P). However, it is not known whether the forms of *Puccinia recondita* infesting cereals in Poland are able to infest orange balsam. If so, should *Impatiens capensis* expand throughout Poland, the intensification of cereal infections caused by this pathogen, leading to economic loss, is possible.

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

- significantly negative
- moderately negative
- neutral
- moderately positive
- significantly positive

aconf28. Answer provided with a

low	medium	high
		X

 level of confidence

acomm32. Comments:
Impatiens capensis due to the high content of sugars and amino acids in its nectar (Rust 1977, Lanza et al. 1995 – P), may distract pollinators from native species, as is similarly in the case with *Impatiens glandulifera* (Chittka and Schürkens 2001, Cawoy et al. 2012 – P).

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

- significantly negative
- moderately negative
- neutral
- moderately positive
- significantly positive

aconf29. Answer provided with a

low	medium	high
		X

 level of confidence

acomm33.

Comments:

Impatiens capensis does not have a visible effect on cultural services: on science, education, the spiritual sphere or artistic resources (Matthews et al. 2015 – P). A wider expansion of the species could affect the aesthetics of the area: in a positive way in the season of plant flowering and in a negative way – at the end of its growing season when excess dead plant material accumulates.

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
- not change
- increase moderately
- increase significantly

aconf30.

Answer provided with a

low	medium X	high	level of confidence
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acomm34.

Comments:

Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 – P) for Central Europe are so complicated that they do not allow drawing unambiguous conclusions concerning their effect on the degree of invasiveness of *Impatiens capensis*. Therefore, it has been accepted, as in other studies (Matthews et al. 2015 – P), that they will not affect this phenomenon.

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
- not change
- increase moderately
- increase significantly

aconf31.

Answer provided with a

low	medium X	high	level of confidence
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acomm35.

Comments:

Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 – P) for Central Europe are so complicated that they do not allow drawing unambiguous conclusions concerning their effect on the degree of invasiveness of *Impatiens capensis*. Therefore, it has been accepted, as in other studies (Matthews et al. 2015 – P), that they will not affect this phenomenon.

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
- not change
- increase moderately
- increase significantly

aconf32. Answer provided with a

low	medium X	high
-----	--------------------	------

 level of confidence

acomm36. Comments:
Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 – P) for Central Europe are so complicated that they do not allow drawing unambiguous conclusions concerning their effect on the degree of invasiveness of *Impatiens capensis*. Therefore, it has been accepted, as in other studies (Matthews et al. 2015 – P), that they will not affect this phenomenon.

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
- not change
- increase moderately
- increase significantly

aconf33. Answer provided with a

low	medium X	high
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 level of confidence

acomm37. Comments:
Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 – P) for Central Europe are so complicated that they do not allow drawing unambiguous conclusions concerning their effect on the degree of invasiveness of *Impatiens capensis*. Therefore, it has been accepted, as in other studies (Matthews et al. 2015 – P), that they will not affect this phenomenon.

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
- not change
- increase moderately
- increase significantly

aconf34. Answer provided with a

low	medium X	high
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 level of confidence

acomm38. Comments:
Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 –P) for Central Europe are complicated and do not allow drawing unambiguous conclusions concerning this subject. For this reason it has been agreed that the effect of *Impatiens capensis* on cultivated plants will not change under the influence of climate changes.

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
- not change
- increase moderately
- increase significantly

aconf35. Answer provided with a

low	medium	high X
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 level of confidence

acomment39. Comments:
Impatiens capensis does not have a noticeable impact on domesticated animals and forecast change in climate will not affect the present situation (Matthews et al. 2015 – P).

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

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf36. Answer provided with a

low	medium	high X
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 level of confidence

acomment40. Comments:
Impatiens capensis does not have a noticeable impact on domesticated animals and forecast change in climate will not affect the present situation (Matthews et al. 2015 – P).

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

- decrease significantly
- decrease moderately
- not change
- increase moderately
- increase significantly

aconf37. Answer provided with a

low	medium X	high
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 level of confidence

acomment41. Comments:
Forecast change in climate (Anders et al. 2014 – P) and hydrological regime (Stagl et al. 2014 – P) for Central Europe are complicated and do not allow drawing unambiguous conclusions concerning this subject. Therefore, it has been accepted, as in other studies (Matthews et al. 2015 – P) that the effect of *Impatiens capensis* on other domains will not change under the influence of climate changes.

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	0.75	1.00
Environmental impact (questions: a13-a18)	0.75	0.60

Cultivated plants impact (questions: a19-a23)	0.10	0.90
Domesticated animals impact (questions: a24-a26)	0.00	1.00
Human impact (questions: a27-a29)	0.00	1.00
Other impact (questions: a30)	0.25	0.50
Invasion (questions: a06-a12)	0.92	1.00
Negative impact (questions: a13-a30)	0.75	0.80
Overall risk score	0.69	
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 is regularly repeated.

acom42.

Comments:

In this risk assessment orange balsam has been considered a moderately invasive alien species because of the high score in the assessment of the module for the effect on the natural environment (questions: a13-a18) – 0.75. In other modules the species obtained low scores: effect on other objects (question a30) – 0.25, effect on cultivated plants (questions: a19-a23) – 0.10, effect on human health (questions: a27-a29) – 0.0, effect on animal husbandry (questions: a24-a26) – 0.0.

In view of the fact that this species is already established in Poland and has a fairly high ability to spread, the result obtained in the present assessment in the modules related to the invasion process (questions: a06-a12) is high and amounts to 0.92.

Because of the potential effect of the species on the natural environment, similar to the effect of Himalayan balsam *Impatiens glandulifera*, it is recommended to list it among priority species and undertake remedial actions. They should include: a) removal of the species on trial plots combined with the development of the most effective method (e.g. mowing or pulling out); b) monitoring of areas adjacent to the area already occupied by the species, and in the case of increase in the number of sites, intensification of actions leading to the elimination of existing populations.

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