



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. Krzysztof Dudek
2. Piotr Tryjanowski – external expert
3. Wojciech Solarz

acomment01.	Comments:	degree	affiliation	assessment date
		(1) dr	Institute of Zoology, Poznań University of Life Sciences; HiProMine S.A.	21-01-2018
		(2) prof. dr hab.	Institute of Zoology, Poznań University of Life Sciences	30-01-2018
		(3) dr	Institute of Nature Conservation, Polish Academy of Sciences in Cracow	09-02-2018

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

Polish name: Biedronka azjatycka
Latin name: ***Harmonia axyridis*** (Pallas, 1773)
English name: Harlequin ladybird

acomm02.	Comments:	
	Polish name (synonym I)	Polish name (synonym II)
	–	–
	Latin name (synonym I)	Latin name (synonym II)
	<i>Coccinella axyridis</i>	<i>Coccinella aulica</i>
	English name (synonym I)	English name (synonym II)
	Asian ladybeetle	–

a03. Area under assessment:

Poland

acomm03.	Comments:
	–

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

<input type="checkbox"/>	native to Poland
<input type="checkbox"/>	alien, absent from Poland
<input type="checkbox"/>	alien, present in Poland only in cultivation or captivity
<input type="checkbox"/>	alien, present in Poland in the environment, not established
<input checked="" type="checkbox"/>	alien, present in Poland in the environment, established

aconf01.	Answer provided with a	low	medium	high	level of confidence
				X	

acomm04.	Comments:
	Harlequin ladybird <i>Harmonia axyridis</i> was first identified in Poland in 2006 (Przewoźny 2007 – P), and now it is found throughout the country and forms numerous and stable populations that successfully overwinter and reproduce. A lot of information about its occurrence in various regions of Poland can be found in local scientific journals, on discussion forums, as well as in the mass media because its emergence is widely commented on (Kubisz 2014 – I).

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

<input checked="" type="checkbox"/>	the environmental domain
<input checked="" type="checkbox"/>	the cultivated plants domain
<input type="checkbox"/>	the domesticated animals domain
<input checked="" type="checkbox"/>	the human domain
<input checked="" type="checkbox"/>	the other domains

acomm05.	Comments:
	Harlequin ladybird has a negative impact on 4 domains: environmental, cultivated plants, human, and other domains. Its impact on the natural environment is negative and related to the fact that this species is omnivorous. It competes with native species of ladybirds and preys on them, mainly on their eggs and larvae (Koch 2003, Pell et al. 2008 – P). It has an impact on cultivated plants in two ways. Harlequin ladybird is an effective predator of aphids and reduces their numbers in crops (Takizawa et al. 2000, Soares & Schanderl 2001 – P), but it also damages fruits by feeding on their flesh (Pickering et al. 2004 – P). The impact on humans is associated with the fact that harlequin ladybird is able to bite human skin and cause allergic reactions (Goetz 2007, 2008, Huelsman et al. 2002 – P). <i>Harmonia axyridis</i> also has a negative impact on architectural structures. In winter months, it forms large colonies on residential and non-residential buildings (Huelsman et al. 2002 – P), as well as industrial structures, e.g. wind turbines (Dudek et al. 2015 – P). Its presence on industrial structures does not necessarily have negative consequences, but harlequin ladybirds colonizing homes cause discomfort to occupants and even negative health reactions, mostly dermatological (Huelsman et al. 2002 – P).

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:

<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	

acomm06. Comments:
The species is already established in the whole of Poland (Kubisz 2014 – I). Therefore, according to the methodology the answer 'high' with 'high' level of confidence are required.

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:
The species is already established in the whole of Poland (Kubisz 2014 – I). Therefore, according to the methodology the answer 'high' with 'high' level of confidence are required.

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

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

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

acomm08. Comments:
The species is already established in the whole of Poland (Kubisz 2014 – I). Therefore, according to the methodology the answer 'high' with 'high' level of confidence are required.

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:

<input type="checkbox"/>	non-optimal
<input type="checkbox"/>	sub-optimal
<input checked="" type="checkbox"/>	optimal for establishment of <i>the species</i>

aconf05.	Answer provided with a	low	medium	high X	level of confidence
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acomment09. Comments:
The species is already established in the whole of Poland (Kubisz 2014 – I). Therefore, according to the methodology the answer ‘high’ with ‘high’ level of confidence are required.

a10. Poland provides **habitat** that is

<input type="checkbox"/>	non-optimal
<input type="checkbox"/>	sub-optimal
<input checked="" type="checkbox"/>	optimal for establishment of <i>the species</i>

aconf06.	Answer provided with a	low	medium	high X	level of confidence
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acomment10. Comments:
The species is already established in the whole of Poland (Kubisz 2014 – I). Therefore, according to the methodology the answer ‘high’ with ‘high’ level of confidence are required. Field observations have shown that Asian ladybirds prefer habitats in agricultural landscape with abundant food (Koch 2003 – P). However, this species prefers overwintering in anthropological structures, therefore it migrates to cities during the autumn (Koch 2003 – 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:

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

aconf07.	Answer provided with a	low	medium	high X	level of confidence
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acomment11. Comments:
Spread from a single source. (Type of data: A)
Like all *Coccinellidae*, *H. axyridis axyridis* has a very strong potential for migration. Individuals are able to fly over ten-kilometre distances (Jeffries et al. 2013 – P), and much longer when they use wind currents (Hodek et al. 1993 – P).
Spread of populations. (Type of data: B)
The species rapidly increases its range of distribution. For example, it was first found in Poland in 2006 (Przewoźny et al. 2007 – P), and just a few years later it was reported from the whole of Poland (Kubisz 2014 – I). The establishment of the species in the United

Kingdom was also fast and took one decade; in England alone it was established within just 3 years (Roy and Brown 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	level of confidence
				X	

acom12. Comments:
 Because *H. axyridis* prefers anthropogenic structures it is easily dispersed, even at long distances. There are reports on *H. axyridis* found on cars (Korotyayev 2015 – P) and trains (Brown et al. 2011 – P), and when transported on these vehicles the species can quickly colonize new areas many kilometres away from the source populations. Interestingly, the first individual of this species reported from Scotland was found in a suitcase (Majerus 2008 – P).

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

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

acom13. Comments:
H. axyridis creates a serious threat to native species of ladybirds by feeding on their eggs, larvae, as well as adult individuals (Adriaens et al. 2008 – P). Many studies carried out worldwide have demonstrated a decline in the population size of native species in areas occupied by *H. axyridis*, but not all researchers link this decline directly with the emergence of the invasive species (Roy et al. 2016 – P). However, there is no data on influence of Asian ladybirds on native coccinellids in Poland.

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

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

aconf10. Answer provided with a

low	medium	high X
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 level of confidence

acomm14. Comments:
Harmonia axyridis, like other ladybirds, feeds mainly on aphids. For this reason, it creates strong competition in occupied areas and causes a decline in the population of native species e.g. *Coccinella septempunctata* (Ware et al. 2009, Roy et al. 2016 – P).

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	high X
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 level of confidence

acomm15. Comments:
There are no experimental or observational data indicating the ability of *H. axyridis* to interbreed with other species of ladybirds. There is probably a reproductive barrier between these species.

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	high X
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 level of confidence

acomm16. Comments:
The effect should be assessed as medium, because the species is a host to at least 1 pathogen, which infects native species that are not of special concern, and causes a slight, if any, decline in their population size. *H. axyridis* is a host to parasites such as protozoan *Gregarina barbarara* and nematodes *Parasitylenchus* spp., although their prevalence is low (Dudek et al. 2017 – P), as well as the fungus *Hesperomyces virescens* (Haelewaters et al. 2014 – P), which also infects native species, e.g. *Coccinella septempunctata*. *H. axyridis* also carry microsporidia that are probably harmless to them but can infect native ladybirds (Gegner et al. 2015 – P).

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

- low
- medium
- high

aconf13. Answer provided with a

low	medium	high X
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 level of confidence

acomm17. Comments:
H. axyridis has no effect on the abiotic properties of the ecosystem and poses no threat to ecosystem integrity in this regard. There are no data on the negative effect of the species on these aspects, and its biology and characteristics preclude the possibility of modifying the abiotic properties of the ecosystem.

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

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

aconf14.	Answer provided with a	low	medium	high	level of confidence
		<input checked="" type="checkbox"/>			

acomment18. Comments:
H. axyridis does not cause a significant disturbance in the function of the ecosystem and its biotic properties, although data on this subject are very limited.

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:

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

aconf15.	Answer provided with a	low	medium	high	level of confidence
				<input checked="" type="checkbox"/>	

acomment19. Comments:
 The impact of the species on cultivated plants is low and causes minor yield losses below 5%. The probability of influence is estimated as medium (impact on 1/3 – 2/3 of target crops). *H. axyridis* feeds on grapevines, indirectly deteriorating wine flavour (Pickering et al. 2004 – P). There are some observational data regarding damage to other fruits in orchards caused by this species (Koch and Galvan 2008 – P).

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

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

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

acomment20. Comments:
 This is not a plant species, therefore there is no possibility of competition.

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
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 level of confidence

acomm21. Comments:
This is not a plant species.

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:
The species has no effect on the cultivation system’s integrity; cases of fruit yield loss are marginal and the species causes little damage. It has been estimated that the impact affects less than 1/3 of cultivated plant targets, and in the worst case the health of plants is deteriorated or the yield of a single crop is reduced by less than approx. 5%.

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	high X
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 level of confidence

acomm23. Comments:
There is one known pathogen of *H. axyridis* included in the EPPO A2 list – *Verticillium lecanii* (Aqueel et al. 2013 – P). Therefore, according to the methodology, the answer ‘medium’ and ‘high’ level of confidence are required.

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:
This species is not a parasite and as a predator – it cannot have any influence on farmed animals or pets.

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:
The probability of contact between *H. axyridis* and domesticated animals is high (more than 100 cases per 100 000 animals annually), and the effect of contact is small and caused mostly by haemolymph secreted by stressed ladybirds (Dudek – A). Potential allergic reactions after contact with *H. axyridis* are short-lasting. A single case was reported (Stocks and Lindsey 2008 – P), but there are also media reports on ladybirds found on dogs.

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 X
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 level of confidence

acomm26. Comments:
There are a few pathogens common for *H. axyridis* and farm animals, e.g. *Ehrlichia ovina* (Dudek et al. 2017 – P) but these pathogens are transported between animals by vectors, e.g. ticks, so there is no risk of direct or indirect transmission between *H. axyridis* and farm animals. There are no known pathogens of *H. axyridis* included into the OIE list.

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:
This is not a parasitic species.

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:
Ladybirds overwinter in houses and cellars, which increases the chance of human contact with *H. axyridis*. However, potential bites or contact with haemolymph of *H. axyridis* cause rare and mild allergic reactions (Goetz et al. 2008 – P). Accidental ingestion of a ladybird is possible, which may adversely affect the human health (Mazza et al. 2014 – P). However, medical consultations are rare, the disease does not cause absenteeism from work or permanent deficits, and the stress level is low. Probablity was estimated as medium (1-100 cases per 100 000 people annually) and the effect is small.

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 X	high
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 level of confidence

acomm29. Comments:
There is at least one pathogen shared by the species and humans, but the disease caused by this pathogen is completely curable. Ladybirds and humans share some pathogens, e.g. *Chlamydia* and *Ehrlichia* (Dudek et al. 2017 – P), but direct infection is very unlikely because *Chlamydia* is a sexually transmited pathogen and *Ehrlichia* is a tick-borne pathogen. According to our expertize, we estimated the effect of the species on human health as very low.

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:

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

aconf26.	Answer provided with a	low	medium	high	level of confidence
				<input checked="" type="checkbox"/>	

acomment30. Comments:
H. axyridis forms large colonies in anthropogenic structures in winter. They occupy windows of buildings and cellars, and try to enter interiors (Huelsman et al. 2002 – P). *H. axyridis* also occupy other structures, e.g. wind turbines (Dudek et al. 2015 – P). Their presence causes soiling with faeces, haemolymph, and often with the bodies of dead individuals (Dudek – A). The probability of such incidents is high but their effect is small, completely reversible, and therefore the overall impact is estimated as medium.

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:

<input type="checkbox"/>	significantly negative
<input type="checkbox"/>	moderately negative
<input type="checkbox"/>	neutral
<input checked="" type="checkbox"/>	moderately positive
<input type="checkbox"/>	significantly positive

aconf27.	Answer provided with a	low	medium	high	level of confidence
				<input checked="" type="checkbox"/>	

acomment31. Comments:
H. axyridis has a small negative effect on the cultivation of orchard plants (Pickering et al. 2004 – P) but a positive effect on crops because it effectively eliminates aphids (Koch 2003 – P).

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

<input type="checkbox"/>	significantly negative
<input type="checkbox"/>	moderately negative
<input type="checkbox"/>	neutral
<input checked="" type="checkbox"/>	moderately positive
<input type="checkbox"/>	significantly positive

aconf28. Answer provided with a

low	medium	high X
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 level of confidence

acomm32. Comments:
H. axyridis is a predator and significantly reduces the population of aphids, which are a major pest of many crops (Koch 2003 – P). For that purpose it was intentionally released on crops, which initiated its invasion. However, this species may also transmit dangerous pathogens, e.g. *Verticillium lecanii* (Aqueel et al. 2013 – 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
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 level of confidence

acomm33. Comments:
 The emergence of this species is widely commented on in the media, which improves knowledge about nature in the society which can be considered as positive for awareness raising. On the other hand, a negative aspect of the Asian ladybird presence is that it changes the perception of the ladybird as a dangerous and unpleasant animal. Before the Asian ladybird invasion, ladybirds were perceived as harmless, and mostly associated with the native *Coccinella septempunctata*. In addition, the abundant emergence of this species, e.g. during migration to wintering grounds, may cause discomfort to humans staying in the open air.

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
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 level of confidence

acomm34. Comments:
 The species already occupies the area of the whole of Poland, therefore, according to our expertise, we estimate that climate change will not affect the probability of its introduction.

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	high X
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 level of confidence

acomm35. Comments:
The species already occupies the area of the whole of Poland.

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	high X
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 level of confidence

acomm36. Comments:
The species is already distributed in the whole of Poland and, according to our expertise, we estimated that climate change does not change the distribution of this species.

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:
It can be assumed, according to the expert knowledge, that due to its high adaptability the species will be able to compete even more effectively with native species under conditions of a changing climate.

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:
The species has a low negative impact on orchards; this will probably not change because the fruits are not the main food for ladybirds. The indirect effect on crops, i.e. limiting the population of aphids, probably will not change, either.

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

acomm39. Comments:
The species has no significant impact on animal production, and it should be assumed, basing on the expert knowledge, that climate change will not change this.

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

acomm40. Comments:
The species is constantly present in the human environment, and its impact on humans is not expected, according to our knowledge, to change as a result of climate change.

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	high X
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 level of confidence

acomm41. Comments:
The species already occupies infrastructure, and climate change will not cause any changes in this respect.

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)	0.17	0.67
Cultivated plants impact (questions: a19-a23)	0.25	1.00
Domesticated animals impact (questions: a24-a26)	0.38	1.00
Human impact (questions: a27-a29)	0.13	0.75
Other impact (questions: a30)	0.50	1.00
Invasion (questions: a06-a12)	1.00	1.00
Impact (questions: a13-a30)	0.50	0.88
Overall risk score	0.50	
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 is regularly repeated.

acom42. Comments:

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Data sources

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2. Databases (B)

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3. Unpublished data (N)

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4. Other (I)

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5. Author's own data (A)

Dudek K. – personal observations.