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. Adam Tofilski
2. Andrzej Oleksa – external expert
3. Wojciech Solarz

acomm01. Comments:

	degree	affiliation	assessment date
(1)	dr hab.	University of Agriculture in Krakow	22-01-2018
(2)	dr hab.	Department of Genetics, Institute of Experimental Biology, Kazimierz Wielki University, Bydgoszcz	22-01-2018
(3)	dr	Institute of Nature Conservation of the Polish Academy of Sciences in Cracow	26-01-2018

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

Polish name: –

Latin name: ***Vespa velutina nigrithorax*** de Buysson, 1905

English name: Asian hornet

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:

Polish name (synonym I) –	Polish name (synonym II) –
Latin name (synonym I) *Vespa auraria*	Latin name (synonym II) *Vespa flavitarsa*
English name (synonym I) Yellow-legged hornet	English name (synonym II)

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: So far, there have been no reports on the presence of Asian hornet in Poland, and its nearest known positions are located at a distance of about 500 km from the Polish borders, in south-western Germany (Witt 2015 - P).

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

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

acomm05.	Comments: The influence of the Asian hornet on the natural environment within the introduced range has not yet been sufficiently documented, however, it seems that the emergence of this species may at least contribute to the change of the existing structure of insect communities. Firstly, due to the similar food preferences, competition with native species of wasps (e.g. with the domestic European hornets *Vespa crabro*) is possible. Secondly, the Asian hornet is an efficient predator catching not only honey bees, but also other insects, including other hymenoptera and dipterous insects (Villemant et al. 2011b - P; Monceau et al. 2014 - P). Potentially, it can have a negative impact on ecosystem services, such as pollination of plants, and thus also have an indirect influence on the cultivation of **entomophilous** plants. As a highly negative we should assess the impact of Asian hornet on animal husbandry, specifically on the apiculture, as it is a highly efficient predator of honeybee (Shah and Shah 1991 - P; Rortais et al. 2010 - P; Monceau et al. 2014 - P). Since a large number of Asian hornet nests are established in Europe in urbanized areas (Villemant et al. 2011b - P), i.e. close to human surroundings, and nests are built directly on tree branches, more frequent interaction with humans is expected than in the case of the *V. crabro* native hornet. In the natural range, Asian hornets are considered highly aggressive (Ho et al. 1999 - P). For this reason, although the venom of the Asian hornet does not differs in terms of venom toxicity from the venom of the European hornet (De Haro et al.

2009 - P), it may turn out to be an insect that is even less socially acceptable and definitely has negative connotations. The effects on plant cultivation may be associated with damage to fruit and young shoots. In very rare cases, it can build nests on infrastructure elements (e.g. on buildings), which, however, does not lead to their damage or significant functional impairment. It is worth emphasizing, however, that nests are usually built on tree branches.

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:

The potential risk of Asian hornet invasion was assessed using the climate suitability model (Villemant et al. 2011a - P). According to these results, the most appropriate area in Europe, in addition to France, extends to neighbouring countries, mainly along the Atlantic coast, the Mediterranean coast and the southern shores of the Black and Caspian Seas, while Central, Eastern and Northern Europe are unsuitable due to too cold climate, especially low temperatures in winter. Nevertheless, progressive global warming may contribute to an increase in the chances of species to occur in Poland, especially in the western part of the country. There is a single report on the occurrence of this species in Germany, but it has not established a stable population there.

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

	low
X	medium
	high

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

acomm07. Comments:

The species can easily be brought to Poland due to unintentional actions. The most likely is bringing of wintering females (inseminated queens) that in spring may create new colonies (nests). As a rule, they spend the winter in small spaces under the bark of trees or in the soil. It is easy to imagine transporting females with imported building materials, horticulture, wood material, bark or potted plants from crops in south-western Europe (e.g. with large potted specimens of olive or palm trees, sold in garden centres). Trading in such materials is not restricted within the European Union. In *V. velutin nigrithorax* the winter diapause can last for a few months, which was sufficient to transport the first females from China to France. Due to the fact that the first report of Asian hornet was made in France near a gardening company that produces bonsai trees, it is assumed that females were introduced with the transport of ceramic pots imported from Yunnan province in China (Villemant et al., 2006 - P). For this reason, not only unintentional transport within the European Union is highly probable, but also a re-importation from the natural range. Despite this, there is no evidence of multiple introductions of the species from the original

	Asian range to Europe - expansion of the secondary range of V. velutina from France to neighbouring countries was most likely due to self-running expansion (Budge et al. 2017).It is much less likely to introduce entire nests, because they are much easier to spot and eliminate. It can be predicted that in the next decade the number of introductions will not exceed 10.

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	high **X**	level of confidence

acomm08.	Comments: The Asian hornet is not a species valued by man because of any properties. On the contrary, in the general perception, a large stinging insect is disliked. It is an enemy for honey bees, i.e. the most economically important insects (Shah and Shah 1991b - P, Tan et al., 2007 - P, Rortais et al. 2010 - P; Monceau et al. 2014 - P). It has no positive meaning as a decorative or functional species. For this reason, the introduction of this species due to intentional actions is not in the interest of anyone. In the next decade, this should not happen.

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

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

acomm09.	Comments: According to the climate suitability model (Villemant et al. 2011a - P), the area of Poland is characterized by unfavourable climatic conditions for the Asian hornet. On the other hand, some models predict that locations in southern Poland are characterized by a climate favourable to Asian hornets (Ibánez-Justicia and Loomans 2011 - P). Guided by the precautionary principle, it was therefore considered that there are moderately favourable climatic conditions for the establishment of the species in Poland.

a10. Poland provides **habitat** that is

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

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

acomm10.	Comments: The Asian hornet is an insect that easily adapts to a wide range of anthropogenic (agricultural and urban areas) and semi-natural environments, both in the original and the

	introduced range. For this reason, Poland's habitat conditions seem to be favourable for establishment of the species.

A3 | Spread

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

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

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

	very low
	low
	medium
	high
X	very high

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

acomm11.	Comments: Dispersal from a single source. In 2005, the species was known in Europe only in one location. In 2010, the species was found in most of western France. The species can cover a distance of over 50 km within a year. The ability to spread V. velutina in Poland is limited by a cooler climate. However, some models predict that sites in southern Poland are characterized by a climate favourable to V. velutina (Ibánez-Justicia and Loomans 2011 - P).

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: So far no presence of the species or its spread has been found in Poland, both with and without human participation. However, there is an average chance of spreading the species with a low chance of being settled. Assuming that the species settles down in Poland, potentially, a man could mediate in its further spread, because the transport of goods over long distances creates high chances for the hornets to be introduced. It can be predicted that in one decade the number of cases of species spreading in such a way will not exceed 10.

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**:

	inapplicable
	low
X	medium
	high

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

acomm13. Comments:

Asian hornet *V. velutina* is a highly effective predator that hunts for honey bees and other insect species (Perrard et al 2009 - P, Villemant et al 2011b - P). Its impact on the honey bee population may be large. It is estimated that in urbanized environments, honey bees can account for up to 2/3 of the diet (Villemant et al 2011b - P). However, the impact of *V. velutina* on populations of insects of special interest (eg legally protected bumblebees *Bombus* spp., or solitary bees, of which 9.2% are considered endangered species - Nieto et al 2014 - P) will probably be much smaller, causing the insignificant declines in their numbers. It is worth emphasizing, however, that the composition of the V. velutina diet has not yet been studied satisfactorily, both in its original and secondary range.

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

	low
X	medium
	high

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

acomm14. Comments:

Possible competition with native species of wasps, especially with *Vespa crabro*, a species of similar body size and food specialization (Villemant et al. 2011b - P, a - P). In case of a significant spread of *V. velutina*, this could lead to a strong decrease in the number of native European hornet.

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

X	no / very low
	low
	medium
	high
	very high

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

acomm15. Comments:

The literature lacks information on the possibility of hybridization with the native European hornet *V. crabro*. This phenomenon probably does not take place.

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

	very low
	low
X	medium
	high
	very high

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

acomm16. Comments:

So far, little is known about parasites or pathogens for which *V. velutina* could be a vector. Garigliany et al. (2017 - P) provide information on the Moku virus detection in *V. velutina*. It is a virus that has been recorded so far in Pennsylvanian wasp (*Vespula pensylvanica*), honey bees and *Varroa destructor* mites. The potential pathogenicity of the Moku virus for honeybees is currently unknown, but its relatively close relationship to the virulent chronic bee paralysis virus gives some grounds for concern (Mordecai et al. 2016 - P). Chauzat et al. (2015 - P) confirmed that in *V. velutina* there are present viruses that cause dangerous diseases of the honey bee: SBV (sacbrood virus), BQCV (black queen cel virus), DWV (deformed wing virus), CBPV (chronic bee paralysis virus) and ABPV (acute bee paralysis virus). These pathogens are not on the OIE list, and the infestation with them may result in at most slight decreases in the population of species that do not belong to the special care species.

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

X	low
	medium
	high

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

acomm17. Comments:

The species does not affect the abiotic factors of the ecosystem (or at least it is not able to do it to a greater extent than native species of social wasps).

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:

The impact of the Asian hornet on the natural environment in the introduced range has still not been satisfactorily documented, but it seems that the appearance of this species can contribute at least to the change of the existing structure of insects communities. Firstly, due to similar food preferences it is possible to compete with native species of wasps (e.g. with the domestic European hornets *Vespa crabro*). Secondly, the Asian hornet is an efficient predator catching not only honey bees, but also other insects, including other hymenoptera and dipterous insects (Villemant et al. 2011b - P; Monceau et al. 2014 - P). Potentially, it can have a negative impact on ecosystem services, such as pollination of plants, in the worst case, however, leading to easily reversible changes in the processes that occur in the areas 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 **X**	medium	high	level of confidence

acomm19. Comments:

Due to its food preferences, the species only to a marginal extent affects crops. It is known that some native wasps (e.g. hornet) sometimes bite bark on the branches of trees and shrubs to cause sap flow, on which they feed (Batra 1980 - P); there is no mention in the literature of this type of behaviour in the Asian hornet, although it can not be ruled out that it may take place. Even in the worst case, this species can affect yields of less than 5%.

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

X	inapplicable
	very low
	low
	medium
	high
	very high

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

acomm20. Comments:

Asian hornet is not a plant, so it is difficult to consider it in the context of competition for crops.

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

X	inapplicable
	no / very low
	low
	medium
	high
	very high

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

acomm21. Comments:

Asian hornet is not a plant, so it is difficult to consider it in the context of competition for crops.

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

X	very low
	low
	medium
	high
	very high

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

acomm22. Comments:

As a efficient predator of honeybees and other pollinating insects the Asian hornet can potentially adversely affect the possibility of pollination of plants, thus becoming a factor limiting the effectiveness of entomophilous crops (Villemant et al. 2011a - P). It can be predicted that in the worst case, it will affect less than 1/3 of crops, and the condition of plants or the yield of a single crop will be 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:

X	very low
	low
	medium
	high
	very high

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

acomm23. Comments:

So far, there are no known plant pathogens for which the Asian hornet could be a vector. There are no known pathogens common to the species and crops, and there are no assumptions that they can be discovered as research progresses.

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
X	high
	very high

aconf20.	Answer provided with a	low	medium	high **X**	level of confidence

acomm24. Comments:

As a highly negative should be assessed the impact of the Asian hornet on the apiary management, as this species is a highly efficient predator of honeybees (Shah and Shah 1991a - P; Rortais et al., 2010 - P; Monceau et al. 2014 - P). The probability of direct contact between *V. velutina* and a single honeybee worker is much smaller than the probability of

contact with a bee colony. Assuming the average density of hornets, the probability of contact between honeybee worker and hornets should be estimated as an average of 1-100 cases per 100,000 animals per year. The effect of such a contact is relatively large because the hornet kills the workers.

The impact of this species on other farm animals is poorly known and probably small. Other wasp species sporadically caused the deaths of farm animals after eating ripe fruit with wasps (Spradbery and Dvorak 2010 - P).

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
X	high
	very high

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

acomm25. Comments:

Direct contact between *V. velutina* and a single honey bee worker, occurs only in the case of predation. The probability of such contact and its effects will be the same as in case of predation (point a24).

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
X	medium
	high
	very high

aconf22.	Answer provided with a	low	medium **X**	high	level of confidence

acomm26. Comments:

So far, little is known about parasites or pathogens for which *V. velutina* could be a vector. Garigliany et al. (2017 - P) provide information on the Moku virus detection in *V. velutina*. It is a virus that has been recorded so far in the Pennsylvanian wasp (*Vespula pensylvanica*), honey bees and *Varroa destructor* mites. The potential pathogenicity of the Moku virus for honeybees is currently unknown, but its relatively close relationship to the virulent chronic bee paralysis virus gives some grounds for concern (Mordecai et al. 2016 - P). Chauzat et al. (2015 - P) confirmed the occurrence of the *V. velutina* viruses that cause serious diseases of honeybees: SBV (sacbrood virus), BQCV (black queen cel virus) DWV (deformed wing virus), CBPV (chronic bee paralysis virus) and ABPV (acute bee paralysis virus). The species may transfer pathogens to the honeybee, but these pathogens are not covered by the notification obligation according to 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:

X	inapplicable
	very low
	low
	medium
	high
	vert high

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

acomm27. Comments:

The Asian hornet is not a parasite.

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

	very low
	low
X	medium
	high
	very high

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

acomm28. Comments:

Stinging insect. The venom of the Asian hornet does not differ in terms of toxicity from venom of the European hornet, but it can be dangerous especially for people with allergies to venom components (De Haro et al. 2009 - P).

The likelihood of contact of hornets with humans should be estimated at 1-100 cases per 100,000 people per year. The effect of the sting should be estimated as average (frequent medical consultations, short absences at work, permanent health losses are rare, average stress level).

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

	inapplicable
X	very low
	low
	medium
	high
	very high

aconf25.	Answer provided with a	low	medium **X**	high	level of confidence

acomm29. Comments:

There are no known pathogens / parasites common to the Asian hornet and humans, and there are grounds to argue that such pathogens / parasites do not exist. Apart from the stinging, there is no contact between hornets and 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:

X	very low
	low
	medium
	high
	very high

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

acomm30. Comments:

In very rare cases, there ispossible construction of nests on infrastructure elements (e.g. on buildings), which, however, does not lead to their damage or significant functional impairment. It is worth emphasizing, however, that nests are usually built on tree branches.

The probability of building a nest in buildings is low: no more than one case per year per 100,000 objects. The effect of this is small and completely reversible. When the hornet nest is active it can be removed only by specialists. After the season the nest is empty and it can be removed by inexperienced person.

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:

As a dangerous predator of honey bees and other pollinating insects, the Asian hornet can negatively affect beekeeping production and indirectly also yielding crops (Villemant et al. 2011a - 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:

As a dangerous predator of honey bees and other pollinating insects the Asian hornet can negatively affect the possibility of pollination of plants (Villemant et al. 2011a - P). By transferring pathogens and parasites, it also affects the incidence of zoonotic diseases.

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 **X**	medium	high	level of confidence

acomm33.	Comments:

The impact is difficult to estimate. With high density of nests, it can potentially be an obstacle for recreation and tourism. Perhaps the Asian hornet, like other insects, can become a source of inspiration in culture and art (Wiśniewski 2001 - P).

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
X	increase moderately
	increase significantly

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

acomm34.	Comments:

The potential risk of Asian hornet invasion was assessed using the climate suitability model (Villemant et al. 2011 - P). According to these results, the most appropriate area in Europe extends, in addition to France, to neighbouring countries, mainly along the Atlantic coast, the Mediterranean coast and the southern shores of the Black and Caspian Seas. Therefore, climate warming will increase the chance of spreading of this species in Europe. In consequence probability of introduction of this species to Poland will increase. The magnitude of the probability will depend on magnitude of climate change.

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
X	increase moderately
	increase significantly

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

acomm35. Comments:

In the light of the results of climate suitability models (Villemant et al. 2011a - P), in case of climate warming probability of establishing of this species in Poland will increase. The magnitude of the probability will depend on magnitude of climate change.

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
X	increase significantly

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

acomm36. Comments:

In the light of the results of climate models (Villemant et al. 2011a - P), in case of climate warming probability of spreading of this species in Poland will increase. The magnitude of the probability will depend on magnitude of climate change.

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
X	increase moderately
	increase significantly

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

acomm37. Comments:

In the light of the results of climate models (Villemant et al. 2011a - P), climate warming will increase probability of population growth of the invasive species. In consequence probability of competition with native species will increase. The magnitude of the probability will depend on magnitude of climate change.

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 **X**	medium	high	level of confidence

acomm38. Comments:

The impact of the species on arable crops is poorly known and only hypothetical. Therefore, it can be assumed that the impact of climate change on this issue could be neglected.

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
X	increase moderately
	increase significantly

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

acomm39. Comments:

Climate warming can lead to an increase in the number of individuals and, consequently, to higher losses in beekeeping.

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
X	increase moderately
	increase significantly

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

acomm40. Comments:

Climate warming may lead to an increase in the number of individuals and, consequently, to an increased risk of stings.

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

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm41. Comments:

Climate change will not significantly increase the very low impact of the species on other objects.

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	0.17	0.67
Establishment (questions: a09-a10)	0.75	0.50
Spread (questions: a11-a12)	0.75	0.50
Environmental impact (questions: a13-a18)	0.33	0.67
Cultivated plants impact (questions: a19-a23)	0.00	0.67
Domesticated animals impact (questions: a24-a26)	0.67	0.67
Human impact (questions: a27-a29)	0.25	0.75
Other impact (questions: a30)	0.00	1.00
Invasion (questions: a06-a12)	0.56	0.75
Impact (questions: a13-a30)	0.67	0.75
Overall risk score	0.37	
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.

acomm42. Comments:
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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)

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