



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. Zbigniew Celka
2. Anna Halladin-Dąbrowska
3. Zygmunt Dajdok

acomment01.	Comments:	degree	affiliation	assessment date
	(1)	dr hab.	Department of Plant Taxonomy, Institute of Environmental Biology, Faculty of Biology, Adam Mickiewicz University in Poznań	23-01-2018
	(2)	dr	Department of Nature Conservation Institute of Ecology and Environmental Protection, Faculty of Biology and Environmental Protection, University of Lodz	24-01-2018
	(3)	dr	Department of Botany, Institute of Environmental Biology, University of Wrocław	01-02-2018

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

Polish name: Kolczurka klapowana

Latin name: ***Echinocystis lobata*** (F. Michx.) Torr. & A. Gray

English name: Wild cucumber

acommm02.

Comments:

The Latin names are given according to the databases (The Plant List 2013, The International Plant Names Index 2005 – B), the Polish names are given according to Flowering plants and pteridophytes of Poland checklist (Mirek et al. 2002 – P). Synonymous names: *Echinocystis echinata* (Muhl. ex Willd) Britton, Sterns & Poggenb., *Echinocystis echinata* Vassilcz., *Hexameria echinata* (Muhl. ex Willd) Torr. & A.Gray, *Micrampelis echinata* (Muhl. ex Willd.) Raf., *Micrampelis lobata* (Michx.) Greene, *Momordica echinata* Muhl. ex Willd and *Sicyos lobatus* Michx. (The Plant List 2013 – B). Polish synonymous names are 'kolczurka (echinocystis) klapowana' (Mirek et al. 2002 – P); the Polish name used by garden plot keepers is 'dziki ogórek', which is a literal translation of the English name (USDA-NRCS 2014 – B). Other English names are: prickly cucumber, wild cucumber vine, balsam apple, balsam-apple, mock cucumber, mock-apple, wild balsam-apple (Minnesota Wildflowers 2018, Flora of Missouri 2018, Tropicos 2018 – B).

Polish name (synonym I)
Echinocystis klapowana

Polish name (synonym II)
dziki ogórek

Latin name (synonym I)
Micrampelis lobata

Latin name (synonym II)
Sicyos lobata

English name (synonym I)
Balsam-apple

English name (synonym II)
Prickly cucumber

a03. Area under assessment:

Poland

acommm03.

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

acommm04.

Comments:

Echinocystis lobata originated in North America is considered to be one of the established species of a foreign origin, invasive kenophytes in Poland (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). It is present all across the country, and numerous clusters of sites are located in the south-eastern and central part of Poland (Zajac and Zajac 2001, Tokarska-Guzik 2005 – P), also in the Carpathian Mountains and their frontier area (Zajac and Zajac 2015 – P). It is particularly frequent in the valleys of large rivers and their tributaries (Dajdok and Kacki 2009, Zajac and Zajac 2015 – P), as well as in and around large cities (Dyderski and Jagodziński 2014, Zajac and Zajac 2015 – P). In an invasion, it uses river valleys (Dajdok and Kacki 2003, Tokarska-Guzik 2005, Zajac et al. 2011 – P). It is an ornamental species as often cultivated in the backyard gardens as in gardens, spread on anthropogenic, semi-natural and habitats similar to natural (Rutkowski 2011, Sudnik-Wójcikowska 2011, Zajac and Zajac 2015, Kołaczowska 2016 – P).

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

<input checked="" type="checkbox"/>	the human domain
<input checked="" type="checkbox"/>	the other domains

acommm05. Comments:

Echinocystis lobata is on the list of the 100 most dangerous invasive species in Europe (Vila et al. 2009 – P) and in the group of 'transformers' – plants which transform the infested habitats (Tokarska-Guzik et al. 2008 – P). Wild cucumber grows mainly in tall-herb communities at forest edges of *Artemisietea* class (*Senecion fluviatilis* and *Convolvulion sepium* groups), river wickers (*Salicetum triandro-viminalis* group) and in reed beds such as canary grass reed (*Phalaridetum arundinaceae*), manna grass reed (*Glycerietum maximae*) and cane reed (*Phragmitetum australis*), it also appears in *Bidentetea* class communities on periodically exposed water banks (Dajdok and Kącki 2009, Dyderski and Jagodziński 2014 – P). Due to its very rapid growth, it is able to create dense patches and infest large areas in a short time. This leads to significant deterioration of the lighting conditions and physical deformation of concurrent species (Dajdok and Kącki 2009 – P). This may result in the disappearance of other plant species and a permanent change in the target communities (Tokarska-Guzik et al. 2008 – P). This is a very unfavorable phenomenon, as the species penetrates Natura 2000 protected natural habitats such as: the mountain tall herb communities (*Adenostylion alliariae*) and the riverside tall herbs communities (*Convolvuletalia sepium*) – habitat code: 6430, rivers with muddy banks (3270), willow, poplar, alder and ash tree riparian forests (*Salicetum albo-fragilis*, *Populetum albae*, *Alnenion glutinoso-incanae*, black alder forests) code 91E0 (Tokarska-Guzik et al. 2012 – P). Occasionally it can spread to adjacent fields and contribute to disturbance of the cultivated plant species (Halladin-Dąbrowska 2016 – A). In North America, this plant is a weed in maize and soy plantations (Bagi and Böszörményi 2008 – P). It is also frequently grown in backyard gardens and parcels, despite the ban on growing as a result of including this plant in the list of alien species which, if released into the natural environment, may endanger native species or natural habitats (Regulation ... 2011 – P). The species is also a 'natural reservoir' for many dangerous viral, bacterial and fungal diseases (Bagi and Böszörményi 2008 – P, Najberek 2018 – I). The plant contains cucurbitacin – a chemical compound, which can have potential harmful effects on humans and animals when consumed in large quantities (Bagi and Böszörményi 2008, Dylewski and Maćkowiak 2014 – P). In rare cases, *E. lobata* can contribute to the destruction of elements of infrastructure such as fencing nets or roof gutters (Halladin-Dąbrowska 2016 – A).

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

acommm06. Comments:

In Poland, *Echinocystis lobata* is included in the group of established species of an alien origin, invasive kenophytes (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). The first reports about wild cucumber in Poland date back to the 1930s (Tokarska-Guzik 2005 – P). The literature suggests that it arrived to Poland from two directions: from Germany and Ukraine (Tokarska-Guzik 2005, Dajdok and Kącki 2009, Zajac and Zajac 2015 – P). It can

migrate to Poland from the borderlands of the Czech Republic, Slovakia, Germany, Belarus or Ukraine, where it was (and is) grown as an ornamental plant (Chrtková 1990, Kubát 2002 – P, Plants of Belarus 2003 – B, Jäger and Werner 2005, Jäger et al. 2008, Scholz 2008, Didukh and Burda 2010 – P). Diaspores of the species are spread by gravity or transported along with the water stream, often over very long distances (Klotz 2007– B, Bagi and Böszörményi 2008 – P). Independent expansion of the species from neighboring countries may happen when seed are transported along with water (especially during floods), e.g. in border rivers such as Oder, Nysa Łużycka or Bug. Its fruit is a bag covered with thorns (it resembles a cucumber) containing 4 seeds inside. The fleshy walls of the fruit are filled with air, which allows it to float on water. Seeds and fruits are carried by water and can colonize further parts of the bank line. The dried part of the seed bag may also be carried by wind (Klotz 2007 – B, Dajdok and Kącki 2009 – 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 X	level of confidence
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acomm07. Comments:
Echinocystis lobata is already an established species of a foreign origin in Poland, an invasive kenophyte (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). As a result of unintentional human activity, seeds or whole fruits may be transported to the territory of Poland with other goods (e.g. agricultural products) if they were harvested in areas where the species is present. When analysing possible routes of introduction of the species in Central Europe, Bagi and Böszörményi (2008 – P) indicated a possibility of an unintentional transport of the seeds with cotton transport in the early 20th century.

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 X	level of confidence
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acomm08. Comments:
Today, *Echinocystis lobata* is considered an established species of a foreign origin in Poland, an invasive kenophyte (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). Although the species is included in the Regulation of the Minister of the Environment on alien plants and animals which, if released into the natural environment, may endanger native species or habitats (Regulation ... 2011 – P), it is possible that it remains the subject of trade, including Internet trade (Lenda et al. 2014 – P). It is often cultivated in gardens and backyard gardens as an ornamental plant. It often becomes wild and starts growing near the areas of cultivation; on rubbish dump sites or countryside, and from there it passes to semi-natural and natural habitats (Sudnik-Wójcikowska 2011 – P). The species is also a melliferous plant with flowers attractive to pollinators. The use of *E. lobata* in medicine (Róžański 2009 – B) may contribute to further invasion of this species due to sowing and harvesting for medicinal purposes (Dylewski and Maćkowiak 2014 – P).

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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acom09.	Comments:
	In Poland, <i>Echinocystis lobata</i> is included in the group of established species of a foreign origin, invasive kenophytes (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). Its homeland is the eastern and central part of North America (Sudnik-Wójcikowska 2011 – P, USDA-NRCS 2014 – B) where climate is similar to European. The native range of <i>E. lobata</i> does not exceed 0°C isotherm in North America (Dajdok and Kaćki 2009 – P). In the natural range, on the north from the 0°C isotherm of January, this species is able to form developing populations. In Poland, favourable climatic conditions for the development of this species exist across the whole country. In the native range of the wild cucumber, annual precipitation is (400-) 500-1000 (-1500) mm, with an average temperature of 17-25°C in June, and between +1 and -21°C in January. Low temperatures in winter are necessary to break the dormancy of seeds. The secondary range is similar in terms of climatic conditions, except for the average temperature in January, which ranges from 0° to -5°C (Bagi and Böszörményi 2008 – P). Only the seeds of the wild cucumber are able to survive temperatures below 0°C (Bagi and Böszörményi 2008 – P). The similarity between the climate of Poland and the climate of part of both natural and secondary range of the species ranges between 94-100%, which means that climatic conditions in Poland are optimal for the analyzed species.

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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acom10.	Comments:
	<i>Echinocystis lobata</i> is already an established species of a foreign origin in Poland, an invasive kenophyte (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). In North America, within the primary range, <i>E. lobata</i> grows in fertile and humid habitats, forests and riparian meadows, tall herb communities, river valleys and lake shores, but also in disturbed habitats such as roadsides (Slavik and Lhotska 1967, Mack 1991 – P; USDA-NRCS 2014, e-Floras 2018 – B). This species is often found on soils rich in nutrients, slightly acidic soils of variable moisture, it does not tolerate salinity and flooding during the vegetation period (Bagi and Böszörményi 2008 – P). Within the secondary range, it colonizes similar types of habitat, primarily aquatic and moist, it also grows in anthropogenic habitats (Hulina 1998, Ľavoda et al. 1999, Török et al. 2003, Anastasiu and Negrean 2005, Tokarska-Guzik 2005, Oprea and Sîrbu 2006, Protopopova et al. 2006 – P, Klotz 2007 – B, Borisova 2011, Zelnik 2012 – P).
	Favourable habitat conditions can be found in many places across Poland – the species can be found both in lowlands and mountains. It is often found in the river valleys and in meadow and tall herbs communities. It can also be found in riparian forests and in ruderal

communities along ditches, canals and roads, on rubbish dump sites and in abandoned gardens (Tokarska-Guzik 2005, Bagi and Böszörményi 2008, Dajdok and Kącki 2009 – P). Optimal habitat conditions, corresponding to the requirements of the species, are found practically all over the country, except for the high mountains regions (Tokarska-Guzik 2005, Zajac and Zajac 2015 – 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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acom11. Comments:

Echinocystis lobata is one of the fastest spreading invasive species in Poland. The first reports about wild cucumber in Poland date back to the 1930s (Lademann 1937 – P). First sites growing outside cultivation areas were reported in mid-20th century (Tokarska-Guzik 2005 – P). The invasion in Poland can therefore be considered rapid (Zajac and Zajac 2015 – P). It is present across the country, and numerous clusters of sites are located in the south-eastern and central part of Poland (Zajac and Zajac 2001, Tokarska-Guzik 2005 – P), also in the Carpathian Mountains and their frontier area (Zajac and Zajac 2015 – P). In favorable conditions, it can quickly colonize sites that are distant from one other. This is due to the specific properties of their fruits. They can float on the surface of the water, and dried fruit can be carried by wind. Some seeds fallout from the bag after it is opened, and some after bag dries (Dajdok and Kącki 2009, Dylewski and Maćkowiak 2014 – P). The ability to move with water stream and the rapid speed of growth make it easy for the plant to colonize the shoreline of the watercourses and to grow in river valleys (Klotz 2007 – B, Dajdok and Kącki 2009, Zajac et al. 2011, Dyderski and Jagodziński 2014, Protopopova et al. 2015 – P). High seed productivity (40-160 seeds per plant) and high sprouting rate (70%) (Vinogradova et al. 2010, Protopopova et al. 2015 – P) also contribute to the spread of this species. Wild cucumber is rarely attacked by diseases, is a strong competitor for native plants, and has flowers attractive to pollinators (Klotz 2007 – B, Dajdok and Kącki 2009, Zajac et al. 2011, Protopopova et al. 2015, Kołaczowska 2016 – P, Halladin-Dąbrowska 2016 – A). In addition, no plant and fruit consumption has been observed so far (Bagi and Böszörményi 2008 – P). The data from the Kampinos National Park show that since 1980, when the species was first identified, it has managed to colonize many anthropogenic habitats distributed throughout the Park and in its buffer zone. Two-thirds of the species' sites are located in the Park's buffer zone, one-third within the borders of the main complex of the park (Kołaczowska 2014 – P).

Data on expansion from a single source (Type A data): although large and relatively heavy seeds of the wild cucumber fall near the parent plant, hydrochory (use of water by plants to spread diaspores) plays an important role in the spread of the species. It can be assumed that the possible distance that a species can cover in a year will exceed by several dozen kilometers; dispersion is large or very large. Data on population expansion (Type B data) and estimation of biological mobility of species (Type C data): large or very large dispersion should be assumed for both types of data on the basis of biological and

ecological characteristics of the species. The range of the species in many regions of Central Europe has increased significantly and in a relatively short time; e.g. in Poland, in the last century, the number of sites increased from 7 in the first half of the 20th century to over 2000 in the second half (Tokarska-Guzik 2005 – P). It should be noted that the spread rate of the wild cucumber is amplified by intentional and unintentional human actions.

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

acomment12. Comments:
 Introducing *Echinocystis lobata* into the natural environment and its relocation in this environment is prohibited by law (Regulation... 2011 – P). Considering the attractive qualities of the plant (climbers often planted on fencing nets) as well as its therapeutic significance (Róžański 2009 – B, Dylewski and Maćkowiak 2014 – P, Magiczny Ogród 2018 – B), it cannot be excluded that it is deliberately spread by humans. *Echinocystis lobata* can enter the environment by uncontrolled sowing, as well as from the plant residues with ripe fruit and seeds stored by man on wild garbage dumps (Dajdok and Kaćki 2009, Dylewski and Maćkowiak 2014 – P, Halladin-Dąbrowska 2016 – A). In Poland, the species began to spread after it was introduced to cultivation. Currently, the accidental transfer of its diaspores with waste from gardens from cultivation to the shores of water is still the most common way of spreading this plant. The transfer of seeds with soil during works related to shore strengthening, regulation of river basins or modernization of flood dikes should not be excluded. Cases of mass appearance of wild cucumbers on renovated dikes near the river bed, in the season following earth works have been reported in the Barycz Valley in Lower Silesia (Pielech 2014 – N, Dajdok et al. 2015 – P). Internet sales, which has increased globally despite the introduction of legal regulations in some countries, play an important role in the spread of the species over long distances (Lenda et al. 2014 – 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 checked="" type="checkbox"/>	inapplicable
<input type="checkbox"/>	low
<input type="checkbox"/>	medium
<input type="checkbox"/>	high

aconf09. Answer provided with a

low	medium	high
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 level of confidence

acomm13. Comments:
The species is a non-parasitic plant and does not affect native species through predation, parasitism or herbivory.

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:
Echinocystis lobata, when entering the tall herb and vegetation communities of the forest edge, river shores and riparian forests, strongly influences the native plants through competition (Dajdok and Kącki 2009, Kołaczowska 2016 – P, Halladin-Dąbrowska 2017 – A). It is characterized by rapid growth rate (Bagi and Böszörményi 2008 – P); during a year, its climbers can grow up to 12 m (Klotz 2007 – B). As a heliophyte, it climbs on other herbs, shrubs and trees, significantly limiting their access to light, which often leads to their deformation, reduction of reproductive potential and even to their dieback (Bagi and Böszörményi 2008, Dylewski and Maćkowiak 2014, Weber 2017 – P, Halladin-Dąbrowska 2017 – A). Moreover, it has a significant reproductive potential thanks to its mass flowering and fruiting. Some seeds are sown using autochory (i.e. self-bearing; cases of ballochory, i.e. the use of ballistic mechanisms for seed dispersal were reported), some by hydrochoric means (Bagi and Böszörményi 2008 – P). Seeds remain viable for more than one year (Dajdok and Kącki 2009 – P). In addition, both seeds and the plants have allelopathic properties that limit the sprouting and growth of other plant species (Bagi and Böszörményi 2008, Csiszár et al. 2013 – P). The flowers of the wild cucumber are attractive to pollinators, which can lead to skipping and weaker pollination of the native species by insects (Halladin-Dąbrowska 2017 – A).

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:
In Poland, other species of *Echinocystis* are not present (Mirek et al. 2002, Rutkowski 2011 – P). In the Polish scientific literature there is no information on cross-breeds. This genre is quite stable genetically and has a slight tendency towards hybridization (Bagi and Böszörményi 2008 – P). A cross-breed between *Sicyos angulata* and *Echinocystis lobata* – *Echinosicyos cibiensis* was described in Romania (Bagi and Böszörményi 2008 – P). In Poland, *Sicyos angulata* is a fairly rare and wild kenophyte, mainly found in ruderal habitats (Tokarska-Guzik et al. 2012 – 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

<input type="checkbox"/>	high
<input type="checkbox"/>	very high

aconf12.	Answer provided with a	low	medium	high X	level of confidence
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acommm16. Comments:
There are no known examples of parasitism on wild cucumber individuals. Potentially, species which could be parasitic to *Echinocystis lobata* are the representatives of *Cuscuta* genus (Bagi and Böszörményi 2008 – P). *Echinocystis lobata* is a host of bacteria, fungi and viruses that attack crops (see: a23), including mainly the Cucurbitaceae family, however representatives of this family do not occur in the wild, in Poland. The impact on native species is limited and small.

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

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

aconf13.	Answer provided with a	low	medium	high X	level of confidence
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acommm17. Comments:
Wild cucumber, by its intense vegetative growth, significantly worsens the lighting conditions (Klotz 2007 – B, Dajdok and Kaćki 2009 – P, Halladin-Dąbrowska 2017 – A). Habitat changes caused by *Echinocystis lobata* may have a negative impact on the structure of river valley banks because of the elimination of native species that stabilise the soil (Dylewski and Maćkowiak 2014 – P). Increased coastal erosion of the river valleys can lead to faster degradation of the fascine used for bank strengthening (Halladin-Dąbrowska 2017 – A).

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

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

aconf14.	Answer provided with a	low	medium	high X	level of confidence
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acommm18. Comments:
Echinocystis lobata is considered one of the 100 most dangerous invasive species in Europe (Vila et al. 2009 – P) and belongs to the group of 'transformers' – plants which transform the infested habitats (Bagi and Böszörményi 2008, Tokarska-Guzik et al. 2008 – P). It has a negative impact on the Natura 2000 natural habitats: rivers with muddy banks (3270), willow, poplar, alder and ash tree riparian forests (91E0), and the mountain tall herb communities (6430) (Tokarska-Guzik et al. 2012 – P). During one year, its climbers can grow up to 12 m in length (Klotz 2007 – B). It significantly worsens lighting conditions which had a negative impact on other plants and often leads to their deformation, reduction of reproductive potential and even to their dieback (Klotz 2007 – B, Dajdok and Kaćki 2009, Kołaczowska 2016 – P, Halladin-Dąbrowska 2017 – A). In addition, both seeds and the plants have allelopathic properties that limit the sprouting and growth of other plant species (Bagi and Böszörményi 2008, Csiszár et al. 2013 – P). Strong development of wild cucumbers may in some cases even lead to the destruction of trees in the vicinity of its sites (Dylewski and Maćkowiak 2014 – P). Discussed matters can lead to the degradation of biological diversity of occupied habitats (Klotz 2007 – B, Dajdok and Kaćki 2009, Kołaczowska 2016 – P, Halladin-Dąbrowska 2017 – A). Wild cucumber successfully ousts native species of climbing plants, such as *Humulus lupulus* hops and *Calystegia sepium* bindweed, from the vegetation patches (Dylewski and Maćkowiak 2014 – P). Field

observations of wild cucumbers indicate that this species can last for many years at some sites, while at other sites it can be ephemeral (Dajdok 2016-2017 – A). In the latter case, changes caused by short-term development of the sites with the dominance of the wild cucumber seem to be reversible. The issue of full reversibility of changes of the sites in which wild cucumber was dominant for many years, requires detailed research (Dajdok 2016-2017 – A).

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:

The species is a plant, it does not have parasitic properties.

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:

Only occasionally, wild cucumber spreads to adjacent fields and grasslands, and can contribute to disturbance of other plant species (Celka 2017, Halladin-Dąbrowska 2017 – A). In North America, *Echinocystis lobata* is a weed in maize and soy plantations (Bagi and Böszörményi 2008 – 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

acommm21. Comments:
In Poland, other species of *Echinocystis* are not present, including cultivated species (Mirek et al. 2002 – P). A cross-breed between *Sicyos angulatus* and *Echinocystis lobata* – *Echinocystis cibiensis* was described in Romania (Bagi and Böszörményi – P). In Poland, *Sicyos angulata* is a fairly rare and wild kenophyte, mainly found in ruderal habitats (Tokarska-Guzik et al. 2012 – 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

acommm22. Comments:
Echinocystis lobata, when mass-entering the fields and agricultural lands can cause a disturbance and regression of some of the cultivated plant species. However, this is rare and has a limited range (Halladin-Dąbrowska 2017 – A). In North America, this plant is a weed in corn and soy plantations (Bagi i Böszörményi 2008 – P). In modern Polish literature, there is no information about the influence of *Echinocystis lobata* on the integrity of crops.

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

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

aconf19. Answer provided with a

low	medium	high X
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 level of confidence

acommm23. Comments:
Currently, there are no known examples of parasitism on wild cucumber individuals. Potentially, species which could be parasitic to *Echinocystis lobata* are the species of *Cuscuta* genus (Bagi and Böszörményi 2008 – P). The wild cucumber does not transmit the pathogens included on the list prepared by European and Mediterranean Plant Protection Organisation (EPPO 2014 – B). However, it is a natural host for many dangerous viral diseases: Bean yellow mosaic virus (BYMV), Tobacco mosaic virus (TMV), Cucumber mosaic virus (CMV), Squash mosaic virus (SqMV), Prune dwarf virus (PDV), Prunus necrotic ringspot virus (PNRSV), Potato virus X (PVX), Zucchini yellow mosaic virus (ZYMV). The role of the species in the transmission of viruses closely related to cultivated species of Cucurbitaceae family (CFSV, CLSV, CSBV, MNSV), bacterial diseases caused by i.a. *Erwinia tracheiphila*, *Erwinia carnegieana* and fungal diseases caused by i.a. *Glomerella cingulata* agg., *Colletotrichum lagenarium*, *Pseudoperonospora cubensis* (Bagi and Böszörményi 2008 – P, Najberek 2018 – I), striking numerous species grown in this family in Poland, cannot be excluded.

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:
The species is a plant and does not show such effects.

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:
Echinocystis lobata is a medical plant containing cucurbitacin (Róžański 2009 – B, Dylewski and Maćkowiak 2014 – P) which can have potential harmful effects on humans and animals. When consumed in large quantities it can cause diarrhoea and vomiting (Bagi and Böszörményi 2008, Dylewski and Maćkowiak – P) and therefore poses a potential risk to livestock in case of consumption of larger quantities of plants. In North America, the species was used to stupefy fish in the past (Starkey 2014 – N).

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:
Echinocystis lobata is a plant and is not a host nor a vector of animal parasites nor pathogens.

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:

<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"/>	vert high

aconf23.	Answer provided with a	low	medium	high	level of confidence
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acomm27. Comments:
The species is not a parasitic plant.

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

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

aconf24.	Answer provided with a	low	medium	high	level of confidence
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acomm28. Comments:
Echinocystis lobata is a medical plant containing cucurbitacin (Rózański 2009 – B, Dylewski and Maćkowiak 2014 – P) which can have potential harmful effects when consumed in large quantities it can cause diarrhoea and vomiting (Bagi and Böszörményi 2008, Dylewski and Maćkowiak – P) and therefore poses a potential risk to humans in case of consumption of larger quantities of plants. However, the species is known and popular as an ornamental plant.

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

aconf25.	Answer provided with a	low	medium	high	level of confidence
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acomm29. Comments:
The species is a plant and is not a vector of parasites nor human pathogens.

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 checked="" type="checkbox"/>	low
<input 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:
In rare cases, gutters, fencing nets and small architectural structures may be damaged under weight of *Echinocystis lobata* climbers (Halladin-Dąbrowska 2016 – A). In addition, because of the elimination of native species that stabilise the soil, the discussed species contributes to an increased coastal erosion of the river valleys, which can lead to faster degradation of the fascine used for bank strengthening (Halladin-Dąbrowska 2017 – A). In addition, by changing biotic and abiotic factors *E. lobata* may have a negative impact on the very structure of the banks of the river valleys, which in rare cases can lead to changes in water flow (Dylewski and Maćkowiak 2014 – P).

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 checked="" type="checkbox"/>	moderately negative
<input type="checkbox"/>	neutral
<input 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:
Lack of direct research in this field conducted in Poland. *Echinocystis lobata* is used in horticulture as a fast-growing decorative climbing plant (Tokarska-Guzik et al. 2012 – P). It is also a melliferous plant. In recent years, there were many findings concerning its use in herbal medicine – i.a. its secretional, anti-inflammatory, cholagogic, antifungal and antiparasitic effects have been described (Różański 2009 – B). The main active substance is cucurbitacin, recognised as a substance characteristic of members of Cucurbitaceae family (Leszczyński and Niraz 1978 – P). Large quantities of cucurbitacin can cause harm (Bagi and Böszörményi 2008 – P). The species is also a natural reservoir for many plant pathogens, it limits the growth of co-occurring plant species through competition, which may result in a decreased biodiversity of habitat and, in the case of crops, a slight decline in harvests (Bagi and Böszörményi 2008 – P, Halladin-Dąbrowska 2016, 2017 – A). In addition, *E. lobata* may also negatively affect infrastructure, restrict access to reservoirs and watercourses (Halladin-Dąbrowska 2016, 2017 – A).

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

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

aconf28.	Answer provided with a	low	medium	high X	level of confidence
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acomm32.	Comments:
	In scientific literature there is no data on the direct impact of the genre on regulatory services. <i>Echinocystis lobata</i> belongs to the group of 'transformers' – plants which contribute to changing the character of the infested habitats (Bagi and Böszörményi 2008, Tokarska-Guzik et al. 2008 – P). By changing biotic and abiotic factors <i>E. lobata</i> may have a negative impact on the bank strengtheners and on the very structure of the banks of the river valleys, which in rare cases can lead to changes in water flow intensity (Dylewski and Maćkowiak 2014 – P). The species is also a melliferous plant with flowers attractive to pollinators, which can cause skipping and, in some cases, weaker pollination of the native species by pollinating insects (Halladin-Dąbrowska 2017 – A).

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

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

aconf29.	Answer provided with a	low	medium	high X	level of confidence
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acomm33.	Comments:
	In scientific literature, no information concerning this subject is available. During flowering, the plant has fairly high aesthetic qualities, the flowers produce a very pleasant, intense scent (Halladin-Dąbrowska 2016, 2017 – A, see: a32). The species is often planted in gardens and garden plots, becoming a fashionable plant, which decorates fences and fencing nets, thus changing the cultural habits of the inhabitants of Poland, which should be considered a negative phenomenon (Celka 2017 – A). In some cases, <i>E. lobata</i> may limit access to pond banks and hinder leisure and tourism (Halladin-Dąbrowska 2017 – A).

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	high X
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 level of confidence

acomm34. Comments:
In Poland, *Echinocystis lobata* is considered an established foreign species and an invasive kenophyte which has already overcome geographical barriers and spreads spontaneously (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). It is very common in cultivation as an ornamental climbing plant. It spontaneously escapes from the places of cultivation. It can be found in areas where an average temperature is 17-25°C in June, and between +1 and -21°C in January (Bagi and Böszörményi 2008 – P). The predicted climate change is therefore within the scope of its tolerance.

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
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 level of confidence

acomm35. Comments:
In Poland, wild cucumber has the status of invasive kenophyte established on a national scale (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P). The species spreads spontaneously and is also grown as an ornamental plant in gardens and garden plots, from where it escapes. Lower temperatures in winter (5-10°C) are crucial for the effective sprouting of the seeds of the wild cucumber (Bagi and Böszörményi 2008 – P) – this factor will not have an inhibitory effect on the sprouting capacity. However, the habitat preferences of this species should be taken into account – its habitat establishment in new areas or maintaining the population at places already occupied, on the one hand, may be limited by the predicted periods of drought, and on the other hand, extreme phenomena such as heavy rainfall and periodic flooding of rivers can be a factor beneficial of the wild cucumber. Therefore, it is difficult to clearly determine the impact of the assumed climate change on the situation of the species in our country.

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
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 level of confidence

acomm36. Comments:
The species is already established in Poland (Tokarska-Guzik 2005, Tokarska-Guzik et al. 2012 – P) and spread across the country (Zajac and Zajac 2001, Tokarska-Guzik 2005, Zajac

and Zajac 2015 – P). The species is included in the Regulation of the Minister of Environment on alien plants and animals which, if released into the natural environment, may endanger native species or habitats (Regulation... 2011 – P), but still is frequently grown in the gardens and remains the subject of trade, including Internet trade (Lenda et al. 2014 – P). The predicted climate change falls within its range of tolerance (Bagi and Böszörményi 2008 – P) and is unlikely to have an inhibitory effect on the ability of further spread. According to Gjershaug et al. (2009 – P) the species may potentially spread towards northern parts of Europe, up to Norway. However, the predicted periods of drought and high temperatures may prove to be limiting factors.

37. 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	high X
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 level of confidence

acomment37. Comments:
In Poland, *Echinocystis lobata* is considered an established alien species and an invasive kenophyte which has already overcome geographical barriers (Tokarska-Guzik et al. 2012 – P). It is also cultivated, mainly as an ornamental plant. *Echinocystis lobata* spreads spontaneously in Poland and also escapes from cultivation sites. The predicted climate change falls within its range of tolerance (Bagi and Böszörményi 2008 – P). Further spread of the species may increase the negative impact on the natural environment (see: a05, a14, a17, a18). But it will not be associated with 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
- not change
- increase moderately
- increase significantly

aconf34. Answer provided with a

low	medium	high X
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 level of confidence

acomment38. Comments:
In Poland, wild cucumber has the status of invasive kenophyte established on a national scale (Tokarska-Guzik et al. 2012 – P). Further spread of the species is likely to be associated with the river valleys. The spread in crops outside river valleys can be limited by the forecasted periods of drought and high temperatures in summer. Therefore, it is assumed that the negative impact on crop plants, will not change (see: a20, a22).

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:
Echinocystis lobata is an established species in Poland (Tokarska-Guzik et al. 2012 – P) and is present across the country (Zajac and Zajac 2001, Tokarska-Guzik 2005, Zajac and Zajac 2015 – P). The predicted climate change falls within its range of tolerance (Bagi and Böszörményi 2008 – P). A further increase in the number of sites might intensify the contact between animals and the plant. However, the direct link of this process may in the future be related to climate change in the areas of river valleys, where periodic water surges as a result of predicted extreme phenomena may become a promoting factor (see: a25).

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
-----	--------	------------------

 level of confidence

acomment40. Comments:
 Wild cucumber is already an established species in Poland (Tokarska-Guzik et al. 2012 – P) and is present across the country (Zajac and Zajac 2001, Tokarska-Guzik 2005, Zajac and Zajac 2015 – P). The predicted climate change falls within its range of tolerance (Bagi and Böszörményi 2008 – P) and will not have an inhibitory effect on the ability of further spread. As a result of a further increase in the number of sites (also, despite bans on cultivation, see: Lenda et al. 2014 – P) an increase in the number of human contacts with this plant should be assumed. The danger in case of direct contact is low (see: a28), however, the likelihood of contact may increase on water shores, especially during the period of their use as leisure and recreation areas.

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

acomment41. Comments:
 Wild cucumber is already an established species in Poland (Tokarska-Guzik et al. 2012 – P). It is assumed that the expected climatic changes will not affect their proliferation (Bagi and Böszörményi 2008 – P) and, consequently, their impact on the elements of infrastructure.

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	1.00	1.00
Environmental impact (questions: a13-a18)	0.55	1.00
Cultivated plants impact (questions: a19-a23)	0.20	1.00
Domesticated animals impact (questions: a24-a26)	0.25	1.00
Human impact (questions: a27-a29)	0.25	1.00
Other impact (questions: a30)	0.25	1.00
Invasion (questions: a06-a12)	1.00	1.00
Impact (questions: a13-a30)	0.55	1.00
Overall risk score	0.55	
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:

Echinocystis lobata is currently one of the rapidly spreading species of foreign origin in Europe. Over the course of a century, it has become an established species in many parts of the continent, mainly in its central part. Is on the list of the '100 most dangerous' invasive species in Europe (Vila et al. 2009 – P), and is also referred to as invasive in the national lists (e.i. Tokarska-Guzik et al. 2012 – P). However, the species is not included in the EPPO lists (EPPO 2014 – B, see: Nentwig et al. 2017 – P).

Continued extension of the species range should be associated with its further cultivation, strengthened by Internet commerce (Tokarska-Guzik 2005, Lenda et al. 2014 – P). Migration along river valleys also has a clear impact on the direction and rate of spread of the species (Tokarska-Guzik 2005, Zając et al. 2010, Rutkowska et al. 2011 – P). It is also listed among the fast acclimatising species in south-eastern Europe, e.g. in the Volga Valley (Borisova 2011 – P).

After the risk assessment for Poland, the wild cucumber was classified as a 'moderately-invasive alien species' whose total negative impact on the natural environment falls into the 'medium' category, despite the fact that it has already been widely spread throughout the country and the high rate of further expansion (maximum score in the 'Invasion process' module). It achieved the highest score (0.55) in the 'Environmental impact' module (questions a13-a18). This result likely/with high probability can be related to the biological characteristics of the species (annual plant) and the dynamics of its population development. The species enters many natural and semi-natural habitats, often colonising them on a large scale. *Echinocystis lobata*, however, can behave differently in different seasons of vegetation. After a mass invasion in one year, in the next year, it may not reach the same number, although usually after colonising a particular place it stays there for

a longer time. The impact of this species on individual elements of ecosystems requires detailed research, particularly because it also enters protected areas (e.g. in Poland it was confirmed in 9 national parks; Bomanowska, et al. 2014 – P; based on the currently collected data, the presence of the species has been confirmed in 13 national parks and in several dozen Natura 2000 areas).

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