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. Agnieszka Popiela
2. Zbigniew Sobisz
3. Teresa Nowak

acomm01. Comments:

	degree	affiliation	assessment date
(1)	prof. dr hab.	Department of Botany and Nature Conservation, Faculty of Biology, University of Szczecin	14-01-2018
(2)	dr hab.	Department of Botany and Nature Protection, Institute of Biology and Environmental Protection, Pomeranian University, Słupsk, Poland	21-01-2018
(3)	dr	Faculty of Biology and Environmental Protection, University of Silesia in Katowice	27-01-2018

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

Polish name: Kolcolist zachodni

Latin name: ***Ulex europaeus L.***

English name: Common gorse

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:

Latin names are reported on the basis of The Plant List database (2013 – B). The Polish name is quoted according to a local report concerning the nomenclature of Polish flora (Mirek *et al.* 2002 – P), and the English common names – according to the Invasive Species Compendium database (CABI 2017 – B).

There are many more synonyms for the Latin names than reported below (The Plant List 2013 – B): *Ulex floridus* Salisb., *Ulex hibernicus* G.Don, *Ulex major* Thore, *Ulex opistholepis* Webb, *Ulex strictus* J.Mackay, *Ulex vernalis* Thore.

13 species of the *Ulex* genus, native for southern Europe and northern Africa are known, however the taxonomy of the genus has not been sufficiently known yet (CABI 2017 – B).

Polish name (synonym I)	Polish name (synonym II)
–	–
Latin name (synonym I)	Latin name (synonym II)
Ulex armoricanus	*Ulex compositus*
English name (synonym I)	English name (synonym II)
Furce	Common gorse

a03. **Area** under assessment:

Poland

acomm03. Comments:

–

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
X	alien, present in Poland in the environment, established

aconf01. Answer provided with a

low	medium	high	level of confidence
		X	

acomm04. Comments:

The species found in Poland from the beginning of the 20th century both as farmed, and in the natural environment. Acc. to Tokarska-Guzik *et al.* (2012 – P), the species has the status of an alien, established species.

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

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

acomm05. Comments:

The species is native in the Atlantic part of the Western Europe, frequent on the coast; it is established also in numerous European countries and in the Near East. In other part of the world, it is an aggressive invasive species – it forms large, mostly congeneric, inaccessible agglomerations, heavily limiting the access of grazed animals to pastures, and it modifies native ecosystems. As an invasive species, it has been registered in more than 50 countries (*i.a.* USA, Canada, Chile, RSA, New Zealand, Australia) and is considered one of the most invasive species globally. It was introduced intentionally as an ornamental shrub (mostly for hedges) (Clements *et al.* 2001, Hill *et al.* 2008 – P, CABI 2017 – B). In Poland, the species

affects native components of forest plant communities, which it penetrates, shading the undergrowth layer, and, in consequence, decreasing their species diversity; dislodging native plant species (Ciaciura and Grin-Gofroń 1997 – P).

A1 | Introduction

Questions from this module assess the risk for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation. This leads to *introduction*, defined as the entry of *the organism* to within the limits of *the area* and subsequently into the wild.

a06. The probability for ***the species*** to expand into Poland's natural environments, **as a result of self-propelled expansion** after its earlier introduction outside of the Polish territory is:

	low
	medium
X	high

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

acomm06. Comments:

According to the manual concerning completing the form (*Harmonia*$^{+PL}$ protocol) – for species already established in Poland, the answer "high probability with high certainty" should be chosen. The species has been present in the territory of Poland for more than 100 years and it is not spreading (Zając A. and Zając M. 2018 – B). The species may migrate to Poland from the borderlands from the side of Germany – Mecklenburg-West Pomerania (Haeupler and Muer 2007 – P), where it has been cultivated as an ornamental plant. The plant reproduces mostly generatively by seeds, which are large and heavy, therefore the majority of them falls down in the vicinity of their parent plant. However, the seeds may be transported for larges distances together with water. In the native rangeland of *Ulex europaeus*, participation of bees in dispersal of the seeds, collected for their elaisosomes, is confirmed. Probably also other animals, including birds, may participate in the dispersal of the seeds (CABI 2017 – B).

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

	low
	medium
X	high

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

acomm07. Comments:

Ulex europaeus has been present in the territory of Poland for more than 100 years (Zając A. and Zając M. 2018 – B), however it rarely spreads spontaneously from the places of former cultivation, irrespectively of the human participation. Escape of the common gorse from a manor park adjacent to the "Choczewskie Cisy" [Choczewo Yews] reserve is an example of this type of spreading (Markowski and Fałtynowicz 1993 – P). There is no data from Poland, concerning anthropogenic introduction of the species from other areas. From other area of the secondary rangeland, information on bringing the seeds with mud stick to vehicles and agricultural equipment are reported, as well as – despite the fact that the seeds are large and heavy – together with imported farm animals (sheep) and fodder (CABI 2017 – B).

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

	low
	medium
X	high

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

acomm08. Comments:

According to the manual concerning completing the form (*Harmonia*$^{+PL}$ protocol) – for species already established in Poland, the answer "high probability with high certainty" should be chosen. The species may be introduced locally as an ornamental and melliferous plant (Kolcolist zachodni [Common gorse] 2018a and b – I) or a medical plant (Kolcolist zachodni [Common gorse] 2018c – I). In the western part of the country, the species could be cultivated also in forests (Gibbons and Brough 1992 – P). It may be found in collections of several botanical gardens and arboreta, however it does not spread spontaneously, even in the vicinity of its cultivation spots (Pracownicy ogrodów botanicznych... [Garden workers...] 2018 – N). It is used sometimes as an ornamental shrub in household gardens.

A2 | Establishment

Questions from this module assess the likelihood for *the species* to overcome survival and reproduction barriers. This leads to *establishment*, defined as the growth of a population to sufficient levels such that natural extinction within *the area* becomes highly unlikely.

a09. Poland provides **climate** that is:

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

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

acomm09. Comments:

According to the manual concerning completing the form (*Harmonia*$^{+PL}$ protocol) – for species already established in Poland, the answer "optimal for establishing of the species, with high certainty" should be chosen. The species is cultivated in Poland as an ornamental plant, used mostly for hedges or as a solitaire; moreover, for more than a hundred years, it has been known in single stands in the western part of the country, recommended as easy in cultivation (Kolcolist zachodni [Common gorse] 2018b – I). It is resistant to frost. The common gorse tolerates a broad range of climatic conditions; its occurrence is limited by negative temperatures (Hill *et al.* 2008 – P). Zwólfer (1963 – P) suggests that *U. europaeus* grows best in Europe in the areas with yearly rainfall exceeds 650 mm, in a climate characterised by a high humidity, but a relatively dry summer season. In Western Europe, the species is an invasive taxon, *e.g.* in Norway (Gederaas *et al.* 2012 – P) and on the island of Jersey (Sobisz 2015 – A). The further eastwards from its rangeland, the worse conditions for its development become (Browicz and Jakusz 1961 – P). In the area of Poland, the climatic conditions are in the range of similarity of 94-100%, therefore, they may be considered optimal for the establishment of the species.

a10. Poland provides **habitat** that is

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

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

acomm10. Comments:

According to the manual concerning completing the form (Harmonia^{+PL} protocol) – for species already established in Poland, the answer "optimal for establishing of the species, with high certainty" should be chosen. In its natural rangeland, the species occurs optimally in insolated spots on a soil which is sandy-clayey, moderately humid, slightly acidic or acidic. It tolerates soils of a lower quality too (Hill *et al.* 2008 – P). On British Isles, it is a typical component of moors; also, it occurs on the edges of forests, on pastures and wastelands (CABI 2017 – B). In its secondary rangeland, it is reported in various habitat types, e.g., in Australia, it grows on the edges of forests, on pastures, disturbed terrains, including post-industrial areas and areas along roads (CABI 2017 – B).

In established sites in Poland, it occurs in a dry and low-fertility habitat: a boundary of a pine forest, sand-base sward (Górski 1995 – P, Kowalski 2018 – N). Habitats of such a type are common in Poland; they are potential habitats for pine forests (Matuszkiewicz 2008 – I). However, optimal habitat conditions for the common gorse are constituted by sandy soils of accumulation terraces or lighter clayey soils which are not too humid and weakly acidic (Czekalski 1972, Kowalski and Friedrich 1980 – P).

A3 | Spread

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

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

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

	very low
X	low
	medium
	high
	very high

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

acomm11. Comments:

Estimation (data type: C). The estimation has been carried out based on the biological mobility of the common gorse. Based on the previous literature query, it has been ascertained that *Ulex europaeus* has occurred in Poland since 1806. Since then, it has spread mostly in the western part of the country (Tokarska-Guzik *et al.* 2012 – P). The species reproduces mostly generatively, but it may grow forming outgrowths; also, it has a strong regenerative ability. The number of seeds produced depends on the age and condition of the plants; value from 500 to more than 2000 seeds/m^2 are being reported (CABI 2017 – B). Studies of Hill *et al.* (1996 – P) indicate that the majority of large and heavy seeds falls under the bush, but a small part of them is spread up to 5 m. The seeds do not float, but they may be transferred to large distances by water (Clements *et al.* 2001 – 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	high **X**	level of confidence

acomm12. Comments:

From the previous information, it results that *Ulex europaeus* does not spread as an ornamental plant (Zając A. and Zając M. 2018 – B). Individuals of the common gorse are being sold by horticultural shops, and the salesmen recommend the species as a profusely blooming plant easy to cultivate, as well as a melliferous and medicinal plant (Kolcolist zachodni [Common gorse] 2018a and b – I). Because of the thorns covering shoots, the shrubs have been used for hedges and fencing. Introduction of *Ulex europaeus* to the environment is forbidden by law (Regulation of the Minister of the Environment of 9 September 2011 on the list of plants and animals of alien species that could be a threat to native species or natural habitats in case of their release into the natural environment– P), however, considering the values of the plant, purposeful spreading of this species by humans cannot be excluded.

A4a | Impact on the environmental domain

Questions from this module qualify the consequences of *the species* on wild animals and plants, habitats and ecosystems.

Impacts are linked to the conservation concern of targets. Native species that are of conservation concern refer to keystone species, protected and/or threatened species. See, for example, Red Lists, protected species lists, or Annex II of the 92/43/EWG Directive. Ecosystems that are of conservation concern refer to natural systems that are the habitat of many threatened species. These include natural forests, dry grasslands, natural rock outcrops, sand dunes, heathlands, peat bogs, marshes, rivers & ponds that have natural banks, and estuaries (Annex I of the 92/43/EWG Directive).

Native species population declines are considered at a local scale: limited decline is considered as a (mere) drop in numbers; severe decline is considered as (near) extinction. Similarly, limited ecosystem change is considered as transient and easily reversible; severe change is considered as persistent and hardly reversible.

a13. The effect of *the species* on native species, through **predation, parasitism or herbivory is**:

X	inapplicable
	low
	medium
	high

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

acomm13. Comments:

The species is a plant, it does not affect the native species by predation, parasitism or herbivorousness.

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

	low
	medium
X	high

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

acomm14. Comments:

There is no available data on the subject in Poland. Within the invasive rangeland outside Europe, the influence of the species on native species by competition is very strong. *Ulex europaeus* poses a threat for biodiversity by forming dense brush, inhibiting growth of

other plants. It may dislodge native plants, disturbing the natural succession and altering the plant composition in ecosystems. Moreover, dens populations of *U. europaeus* pose a fire hazard for valuable species and habitats, both directly, and by acidification of the soil. Also, the high biomass of *U. europaeus* causes a high fire hazard. The species often grows on forest edges, so it may spread fire, *i.e.* it maintain the fire and facilitates its spreading, because of the large dry biomass accumulating on the surface (Clements *et al.* 2001 – P). Also data indication that the common gorse causes small drops on the abundances of species are being reported. Despite the fact it reproduces vegetatively by offshoots sprouting from lower parts of shoots or adventitious roots, it is not competitive in relation to the shrub and dwarf shrub layer (Kowalski and Friedrich 1980 – P). Presence of the nitrogen-fixing bacteria in root nodules gives *U. europaeus* a competitive advantage, particularly in case of lean soils (CABI 2017 – B).

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 is no data available for the territory of Poland. A possibility of crossbreeding with *Ulex gallii* was observed within the natural rangeland in the western part of Europe (Misset and Fontenelle 1992 – P). Native species from the *Ulex* genus do not occur in Poland (Rutkowski 2004 – P), so crossbreeding under natural conditions is not possible.

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

	very low
X	low
	medium
	high
	very high

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

acomm16. Comments:

94 species of insects or acarids were identified on *Ulex europaeus* in Europe, 16 for which were sufficiently host-specific to be considered biological control measures (CABI 2017 – B). Natural enemies of the species include, among others: *Fusarium tumidum* (fungus), *Chondrostereum purpureum* (fungus), *Ditylenchus dipsaci* (nematode), *Aceria genistae* (acarid), *Dolichogenidea tasmanica* (of *Hymenoptera*), *Glyptapanteles Demeter* (of *Hymenoptera*), *Gibberella tumida* (fungus) (CABI 2017 – B). Both under natural conditions, and in its secondary geographical range, fungous pathogens were found on the leaves of the species' individuals (Froelich and Gianotti 2000 – P). However, no cases of pathogen or parasite transmission to native species were observed within the secondary rangeland. The mycobiota connected with the species is strictly specialised (Johnston *et al.* 1995 – P).

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

	low
X	medium
	high

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

acomm17. Comments:

The is no data available for the territory of Poland. Within its invasive rangeland, *Ulex europaeus* poses a fire hazard, and the consequences of fires consist in changes in physical, chemical and biological properties of soils, including soil acidification (Clements *et al.* 2001 – P). As a plant spreading along roads, *U. europaeus* also poses a severe fire hazard in suburban areas. The crown of *Ulex europaeus* captures a large part of precipitation, and the soil under the brush is often dry (Lee *et al.* 1986 – P), therefore large shrubs and populations may affect local hydrological conditions (Clements *et al.* 2001 – P). Studies on *Ulex europaeus* indicate that the species may cause changes in physical and chemical properties of the soil (Grubb and Suter 1970 – P). With the abundance of the species observed currently in the confirmed sites in Poland, *i.a.* in Biebrowo and Troszyn, it does not seem that it changes the abiotic factors significantly.

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

	low
	medium
X	high

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

acomm18. Comments:

The is no data available for the territory of Poland. The effect on ecosystem integrity connected with the presence of *U. europaeus* may inhibit development of seedling of native species (Lee *et al.* 1986 – P). *Ulex europaeus* may cause a reduction of biodiversity by forming dense brush, inhibiting growth of other plants. It may dislodge native plants, disturbing the natural succession and altering the plant composition in ecosystems. So far, there has been no research on the influence of *Ulex europaeus* on biotic factors in Poland. Assuming that the common gorse would spread in the whole territory of Poland, its impact would be limited to sandy habitats under our climatic conditions, and there, the species might dislodge native species, limiting the floristic diversity.

A4b | Impact on the cultivated plants domain

Questions from this module qualify the consequences of *the species* for cultivated plants (e.g. crops, pastures, horticultural stock).

For the questions from this module, consequence is considered 'low' when presence of *the species* in (or on) a population of target plants is sporadic and/or causes little damage. Harm is considered 'medium' when *the organism's* development causes local yield (or plant) losses below 20%, and 'high' when losses range >20%.

a19. The effect of *the species* on cultivated plant targets through **herbivory or parasitism** is:

	inapplicable
X	very low
	low
	medium
	high
	very high

aconf15.	Answer provided with a	low	medium	high **X**	level of confidence

acomm19. Comments:

The species is a plant, it has no parasitic properties.

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

	inapplicable
X	very low
	low
	medium
	high
	very high

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

acomm20. Comments:

The species does not affect the crops of species important from the economic point of view. Outside Europe, within its invasive rangeland, the species forms dense brushes inhibiting growth of other plants, including cultivated plants (Clements *et al.* 2001 – P).

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

	inapplicable
X	no / very low
	low
	medium
	high
	very high

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

acomm21. Comments:

There is no data available on crossbreeding with cultivated plants. A possibility of crossbreeding with *Ulex gallii* was observed within the natural rangeland in the western part of Europe (Misset and Fontenelle 1992 – P). There are no crops related to the *Ulex* genus in our country, thus the species has no influence on the crops of species important from the economic point of view.

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

	very low
X	low
	medium
	high
	very high

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

acomm22. Comments:

Mass occurrence of the species on meadows and pastures may cause a decrease in the meadow plant share and harden animal grazing. There is no data available on this subject from the territory of Poland (the common gorse never entered habitats of such type), while outside Europe, within its invasive rangeland, the species forms dense brushes inhibiting growth of other plants, possibly including cultivated plants (Clements *et al.* 2001 – P).

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

	very low
X	low

	medium
	high
	very high

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

acomm23. Comments:

The is no data available for Poland. 94 species of insects or acarids were found on *Ulex europaeus* in Europe, 16 for which were sufficiently host-specific to be considered biological control measures, *i.a. Fusarium tumidum* (fungus), *Chondrostereum purpureum* (fungus), *Ditylenchus dipsaci* (nematode), *Aceria genistae* (acarid), *Dolichogenidea tasmanica* (of *Hymenoptera*), *Glyptapanteles Demeter* (of *Hymenoptera*), *Gibberella tumida* (fungus). The identified pathogens are common for this species and cultivated plants (Froelich and Gianotti 2000, Bourdôt *et al.* 2006 – P, CABI 2017 – B). Pathogens are no listed in EPPO A1 and A2.

A4c | Impact on the domesticated animals domain

Questions from this module qualify the consequences of *the organism* on domesticated animals (e.g. production animals, companion animals). It deals with both the well-being of individual animals and the productivity of animal populations.

a24. The effect of *the species* on individual animal health or animal production, through **predation or parasitism** is:

X	Inapplicable
	very low
	Low
	Medium
	High
	very high

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

acomm24. Comments:

Not applicable – the species is a plant.

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

	very low
X	low
	medium
	high
	very high

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

acomm25. Comments:

There is no information on adverse impact in direct contact. Thorns on stems may hinder movement of animals and cause injuries. The probability of contact with farm animals is low.

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

X	inapplicable
	very low

	low
	medium
	high
	very high

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

acomm26.	Comments: The species is a plant, which is not a vector of parasites or pathogens of animals.

A4d | Impact on the human domain

Questions from this module qualify the consequences of *the organism* on humans. It deals with human health, being defined as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (definition adopted from the World Health Organization).

a27. The effect of *the species* on human health through **parasitism** is:

X	inapplicable
	very low
	low
	medium
	high
	vert high

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

acomm27.	Comments: The species is not parasitic. Even if the species spreads in the whole territory of Poland in the future, it has no impact on human health by parasitism.

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

X	very low
	low
	medium
	high
	very high

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

acomm28.	Comments: So far, there is no such data in the literature. Even if the species spreads in the whole territory of Poland in the future, it does not pose any hazard in direct contact with humans because of its properties. The thorns may inflict injuries.

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

X	inapplicable
	very low
	low
	medium
	high
	very high

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

acomm29. Comments:

The species is a plant, which is not a vector of parasites or pathogens of humans.

A4e | Impact on other domains

Questions from this module qualify the consequences of *the species* on targets not considered in modules A4a-d.

a30. The effect of *the species* on causing damage to **infrastructure** is:

	very low
X	low
	medium
	high
	very high

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

acomm30. Comments:

So far, there is no data on this subject from the territory of Poland. Within its invasive rangeland outside Europe, the species affects a reduction of the acreage of meadows and pastures. (Clements *et al.* 2001 – P). As a plant spreading along roads, on disturbed terrains, *U. europaeus* poses a severe fire hazard in suburban areas (CABI 2017 – B).

A5a | Impact on ecosystem services

Questions from this module qualify the consequences of *the organism* on ecosystem services. Ecosystem services are classified according to the Common International Classification of Ecosystem Services, which also includes many examples (CICES Version 4.3). Note that the answers to these questions are not used in the calculation of the overall risk score (which deals with ecosystems in a different way), but can be considered when decisions are made about management of *the species*.

a31. The effect of *the species* on **provisioning services** is:

	significantly negative
	moderately negative
	neutral
X	moderately positive
	significantly positive

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

acomm31. Comments:

There is no direct data on this subject. Within its invasive rangeland outside Europe, the species affects a reduction of the acreage of meadows and pastures (Clements *et al.* 2001 – P). *Ulex europaeus* has a vast range of values apart from being used for hedges and as an ornamental plant: in its native rangeland, fragmented plants were used as a fodder for farm animals and as mulch. Flower extracts and other plant extracts are sold as alternative medications and homoeopathic agents. In New Zealand, the species is considered an important source of pollen for bees in the spring and a potential fodder crop for goats. Lectins and other bioactive compounds obtained from *U. europaeus* have potential applications in antibiotics, treatment of diseases and combating pests (CABI 2017 – B).

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	high **X**	level of confidence

acomm32. Comments:

There is no direct data on this subject. Within its invasive rangeland outside Europe, the species affects a reduction of the acreage of meadows and pastures (Clements *et al.* 2001 – P). It poses a fire hazard, and the consequences of fires consist in changes in physical, chemical and biological properties of soils, including soil acidification (Clements *et al.* 2001 – P). The crown of *Ulex europaeus* captures a large part of precipitation, and the soil under the brush is often dry (Lee *et al.* 1986 – P), therefore large shrubs and populations may affect local hydrological conditions (Clements *et al.* 2001 – P). Assuming expansiveness of the species in the area of Poland, it may cause changes in physical and chemical properties, most of all, soil acidification (Grubb and Suter 1970 – P).

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

	significantly negative
	moderately negative
X	neutral
	moderately positive
	significantly positive

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

acomm33. Comments:

Basically, the species has no impact on cultural services: sciences, education, spiritual realm or artistic resources. Its mass occurrence might affect the scenery values (aesthetic functions), positively while blooming; thorny shrubs may limit the access to areas used for recreation.

A5b | Effect of climate change on the risk assessment of the negative impact of *the species*

Below, each of the Harmonia^{+PL} modules is revisited under the premise of the future climate. The proposed time horizon is the mid-21st century. We suggest taking into account the reports of the Intergovernmental Panel on Climate Change. Specifically, the expected changes in atmospheric variables listed in its 2013 report on the physical science basis may be used for this purpose. The global temperature is expected to rise by 1 to 2°C by 2046-2065.

Note that the answers to these questions are not used in the calculation of the overall risk score, but can be but can be considered when decisions are made about management of *the species*.

a34. INTRODUCTION – Due to climate change, the probability for *the species* to overcome geographical barriers and – if applicable – subsequent barriers of captivity or cultivation in Poland will:

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm34. Comments:

The species is already present in Poland (Tokarska-Guzik *et al.* 2012 – P, Zając A. and Zając M. 2018 – B). The influence of climate changes on colonisation of new sites by the species is insignificant.

a35. ESTABLISHMENT – Due to climate change, the probability for *the species* to overcome barriers that have prevented its survival and reproduction in Poland will:

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm35. Comments:

The species is already established in Poland (Tokarska-Guzik *et al.* 2012 – P). The influence of climate on colonisation of new sites by the species is insignificant.

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
X	increase moderately
	increase significantly

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

acomm36. Comments:

The species is already established (Tokarska-Guzik *et al.* 2012 –P). Assuming that the temperature will increase by 1-2°C in the future, the air humidity may increase simultaneously – there is a probability of a broader spreading of the species.

a37. IMPACT ON THE ENVIRONMENTAL DOMAIN – Due to climate change, the consequences of *the species* on wild animals and plants, habitats and ecosystems in Poland will:

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm37. Comments:

It is assumed that the presumed climate changes will not affect spreading of the species (there is no direct data in the discussed scope).

a38. IMPACT ON THE CULTIVATED PLANTS DOMAIN – Due to climate change, the consequences of *the species* on cultivated plants and plant domain in Poland will:

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

aconf34.	Answer provided with a	low	medium **X**	high	level of confidence

acomm38. Comments:

The species is already established (Tokarska-Guzik *et al.* 2012 – P). It is assumed that the predicted climate changes will not affect the species and thereby cultivated plants (there is no direct data in the discussed scope).

a39. IMPACT ON THE DOMESTICATED ANIMALS DOMAIN – Due to climate change, the consequences of *the species* on domesticated animals and animal production in Poland will:

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm39. Comments:

The species is already established (Tokarska-Guzik *et al.* 2012 – P). It is assumed that the predicted climate changes will not affect the species and thereby animal breeding (there is no direct data in the discussed scope).

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

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm40. Comments:

The species is already established (Tokarska-Guzik *et al.* 2012 – P). It is assumed that the predicted climate changes will not affect the species and thereby humans (there is no direct data in the discussed scope).

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:

The species is already established (Tokarska-Guzik *et al.* 2012 – P). It is assumed that the predicted climate changes will not affect the species and thereby other objects (there is no direct data in the discussed scope).

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	1.00	1.00
Establishment (questions: a09-a10)	1.00	1.00
Spread (questions: a11-a12)	0.38	1.00
Environmental impact (questions: a13-a18)	0.55	0.90
Cultivated plants impact (questions: a19-a23)	0.10	0.90
Domesticated animals impact (questions: a24-a26)	0.25	1.00
Human impact (questions: a27-a29)	0.00	1.00
Other impact (questions: a30)	0.25	1.00
Invasion (questions: a06-a12)	0.79	1.00
Impact (questions: a13-a30)	0.55	0.96
Overall risk score	0.44	
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 regularly repeated.

acomm42. Comments:

The establishment status of the common gorse in Poland is being debated (Zając 2018 – N). In the sites where the species went back to the wild/probably went back to the wild from cultivation, is spreads rather weakly and even freezes and dies (Michalska-Hejduk *et al.* 1999 – N). Despite the fact that sites of the species have been observed in Poland for more than 100 years (IOP 2009 – B), it exhibits no tendency for spreading. It seems that *Ulex europaeus* does not pose a significant threat in our country.

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