UNIWERSYTET ŚLĄSKI
W KATOWICACH

INSTYTUT OCHRONY PRZYRODY PAN

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. Andrzej Zalewski
2. Marcin Brzeziński – external expert
3. Henryk Okarma

acomm01. Comments:

	degree	affiliation	assessment date
(1)	dr hab.	Mammal Research Institute, Polish Academy of Sciences, Bialowieża	29-01-2018
(2)	dr hab.	Faculty of Biology, University of Warsaw	24-01-2018
(3)	prof. dr hab.	Institute of Nature Conservation, Polish Academy of Sciences in Cracow	29-01-2018

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

Polish name: Mangusta złocista

Latin name: ***Herpestes javanicus*** É. Geoffroy Saint-Hilaire, 1818

English name: Small Asian mongoose

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acomm02.	Comments: Until recently, *Herpestes javanicus* mongoose used to be considered single species. At present, two species are distinguished: small Indian mongoose *Herpestes auropunctatus* and Javan mongoose *Herpestes javanicus* (Thulin et al. 2006 – P). The small Indian mongoose is an invasive species.

Polish name (synonym I) –	Polish name (synonym II) –
Latin name (synonym I) *Urva javanica*	Latin name (synonym II) *Herpestes auropunctatus*
English name (synonym I) Javan mongoose	English name (synonym II) Indian mongoose

a03. **Area** under assessment:

Poland

acomm03.	Comments: –

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

	native to Poland
X	alien, absent from Poland
	alien, present in Poland only in cultivation or captivity
	alien, present in Poland in the environment, not established
	alien, present in Poland in the environment, established

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

acomm04.	Comments: There are no reports on occurrence of the small Indian mongoose in Poland.

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

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

acomm05.	Comments: The small Indian mongoose may affect the natural environment strongly, most of all, by predation. In the areas where it has been introduced by humans and has become an invasive species, it reduces population abundances of numerous animal species of the native fauna significantly (Nellis and Small 1983, Henderson 1992, Yamada 2002, Yamada and Sugimura 2004, Hays and Conant 2007, Barun *et al.* 2010, 2011, Lewis *et al.* 2011 – P). Also, it may compete for resources with other predator species (Barun et al. 2015, Hussain et al. 2017 – P). The share of plant food in the small Indian mongoose's diet may be significant, however the species eats mainly animal food (Pimentel 1955, Henderson 1992, Vilella 1998, Simberloff 2000, Hays and Conant 2007, Hussain et al. 2017 – P) and does not affect plant crops. As a carrier of pathogenic parasites and microorganisms, the small Indian mongooses impair the sanitary condition of the environment. They are carriers of pathogenic organisms, e.g. the hepatitis E virus (Li et al. 2006 – P), rabies virus, *Leptospira* bacteria, endoparasites, and ticks (Baldwin et al. 1952, Huizinga et al. 1976, Webb 1980, Mowlavai *et al.* 2000, Corn et al. 2009 – P), therefore, that adversely affect humans and animal breeding.

A1 | Introduction

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

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

X	low
	medium
	high

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

acomm06. Comments:

The species does not occur in Poland or the neighbouring countries. The nearest area of occurrence of the small Indian mongoose in the wild is constituted by Croatian islands in the Adriatic Sea, Montenegro, Bosnia and Herzegovina (Tvrtković and Kryštufek 1990, Barun et al. 2010, Ćirović et al. 2011 – P). Emergence of the small Indian mongoose in Poland as a result of unassisted expansion from areas currently inhabited by it is very unlikely.

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

X	low
	medium
	high

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

acomm07. Comments:

Accidental and inadvertent introduction of this species is impossible. There is no possibility for transport of this species as a result of unintended human actions.

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

X	low
	medium
	high

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

acomm08. Comments:

The main cause for introduction of the small Indian mongoose outside its natural rangeland was the desire to use this predator in combating animals brought along by humans previously, such as, e.g. rats (Nellis 1989, Hays and Conant 2007 – P) or venomous snakes (Watari et al. 2008, Ćirović et al. 2011 – P). There are no reasons for intentional introduction of this species to the natural environment in Poland. The small Indian mongoose is not a factory-farmed species; probably, it is very rarely kept by humans as a pet animal. Thus, the probability of escapes of these animals from farms is very low.

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:

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

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

acomm09. Comments:

The small Indian mongoose originates from southern and south-eastern Asia. In nature, it occurs in Saudi Arabia, Iran, Iraq, Afghanistan, Pakistan, India, Nepal, Bangladesh, Myanmar (Burma), Thailand, Malaysia, Laos, Vietnam, southern China. It is a thermophilic species (Nellis and McManus 1974 – P), inhabiting areas of tropical and semitropical zones in its natural rangeland. The small Indian mongoose was introduced to numerous ocean islands, among others: in the Caribbean (Cuba, Jamaica, Puerto Rico, Grenada, Hispaniola, Trinidad, Antigua, Guadeloupe and others), Fiji, Hawaii, Okinawa, Amami, Mauritius and in Tanzania, Central and South America (Colombia, Venezuela, Guiana), and in Europe – in Croatia, Bosnia and Herzegovina, and Montenegro (Simberloff et al. 2000, Hays and Conant 2007, Veron et al. 2007, Watari et al. 2008, Ćirović et al. 2011 – P). Climatic conditions in these places are close to those in the natural rangeland of the species. On the other hand, present climatic conditions in Poland exclude the possibility of survival of the small Indian mongoose in the environment. It is assumed that the species is not able to survive in areas where the average temperature in January is lower than 10°C (Nellis and McManus 1974 – P).

a10. Poland provides **habitat** that is

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

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

acomm10. Comments:

The small Indian mongoose occurs in habitats of many various types. It prefer dry environments. In its natural rangeland, it inhabits grassy open and semi-open areas most eagerly, but avoids large and dense forest stands. However, it occurs in various types of forests too, while avoiding mountainous terrains (Jennings and Veron 2011 – P). Often, it occurs near human buildings (Hussain et al. 2017 – P). In the areas of introduction of the small Indian mongoose, e.g. Hawaii and Puerto Rico, it also occurs in more humid environments (Vilella 1998, Hays and Conant 2007 – P). In Mauritius, the small Indian mongoose inhabits, among others, rocky terrains, waterside and grassy environments, sugar cane plantations, and forests (Roy et al. 2002 – P). In Europe, on the Adriatic coast, it occurs in areas covered with sclerophyll vegetation (maquis shrubland) (Ćirović et al. 2011 – P). In forest environments, populations of the small Indian mongoose reach lower densities that in open areas (Vilella 1998 – P). Population densities higher than in other environments occurs in the areas more intensively used by humans, which is connected probably with a better availability of food (Quinn and Whisson 2005 – P). The diet of the small Indian mongoose encompasses, most of all, invertebrates and small vertebrates, including amphibians and reptiles, as well as seeds and fruit (Pimentel 1955, Henderson 1992, Vilella 1998, Simberloff et al. 2000, Hays and Conant, 2007, Hussain et al. 2017 – P). Environmental

	and climatic conditions in Poland do not provide a proper food supply for the small Indian mongoose (particularly invertebrates in winter), preventing this species from survival on the loose.

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:

X	very low
	low
	medium
	high
	very high

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

acomm11.	Comments: Estimation (data type: C) Due to climatic and environmental conditions unfavourable for the small Indian, ability of the species for spontaneous spreading, and probability of expansion of this predator are very low in our country.

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

X	low
	medium
	high

aconf08.	Answer provided with a	low	medium	high **X**	level of confidence

acomm12.	Comments: The possibility of the small Indian mongoose's expansion in Poland with the participation of humans is very small. Firstly, this species is not kept for farming, and in this connection, escapes or intended release of mongooses cannot occur. Secondly, in Poland, there are no rational reasons for the introduction of this species to combat other species considered harmful or dangerous by humans, which is often the cause for spreading of this species in Asia.

A4a | Impact on the environmental domain

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

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

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

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

	inapplicable
	low
	medium
X	high

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

acomm13. Comments:

The small Indian mongoose is a dietary opportunist having a very diverse diet (Pimentel 1955, Henderson 1992, Vilella 1998, Simberloff et al. 2000, Hays and Conant 2007, Hussain 2017 – P). Usually, invertebrate prevail in its food. Also, minute vertebrates are eaten, mostly amphibians and reptiles, as well as seeds and fruit. The shares of the individual groups in the small Indian mongoose's diet is very variable, depending on the type of inhabited environment and food availability. The individual populations may differ significantly in compositions of their food. The high dietary plasticity of the small Indian mongoose is one of the reasons of the successes of this predator as an invasive species in many regions of the world. In the colonised areas, the small Indian mongoose contributed into drops of population abundances or extinction of numerous native species of birds and mammals, *i.a.*: bar-winged rail *Nesoclopeus poecilopterus*, Jamaican petrel *Pterodroma caribbaea*, Audubon's shearwater *Puffinus lherminieri*, pink pigeon *Nesoenas mayeri*, Amami rabbit *Pentalagus furnessi* (Roy et al. 2002, Hays and Conant, 2007, Watari et al. 2008 – P), as well as amphibians and reptiles (e.g. *Alsophis melanichnus*). On several islands of the Fiji archipelago, mongooses caused a decline in abundance of 3 ground-nesting bird species (Morley and Winder 2013 – P). On the Virgin Islands, the small Indian mongoose is the main predator of eggs of hawksbill sea turtle *Eretmochelys imbricata* (Coblentz and Coblentz 1985). The influence of predation of the small Indian mongoose on invertebrate populations is not known. Theoretically, assuming that the species would be widespread in Poland, it could have a large influence on populations of some native animal species, including species of particular concern, such as waterfowl.

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

	low
X	medium
	high

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

acomm14. Comments:

Competitive interactions between the small Indian mongoose and native predators, e.g. beech marten *Martes foina* (Barun et al. 2015 – P) and other predator species, are possible in places of their sympatric occurrence (Jennings and Veron 2011, Hussain et al. 2017 – P). The influence of the small Indian mongoose on populations of other predatory mammals is not known. Theoretically, in Poland, the small Indian mongoose could compete with the beech marten and European polecat *Mustela putorius*.

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:

There is no risk of hybridisation, as the small Indian mongoose is not closely related with native species of predatory mammals inhabiting Europe.

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

	very low
	low
	medium
	high
X	very high

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

acomm16. Comments:

The small Indian mongooses are vectors of pathogens, e.g. the hepatitis E virus (Li et al. 2006 – P), rabies virus, *Leptospira* bacteria, as well as endoparasites and ticks (Baldwin et al. 1952, Corn et al. 2009 – P). The mongoose introduction to Caribbean Islands caused an increase in the frequency of rabies (Abdussalam 1959, Everard C.O. and Everard J.D. 1992 – P). Genetic studies on the rabies virus in Grenada proved that the mongooses are the basic reservoir of this disease (Zieger et al. 2014 – P). Rabies is OIE-listed and it obligatorily notifiable, thus potentially, the influence of the small Indian mongoose, being a rabies vector, on native species may be very strong. As other predator, the mongooses are vectors of many parasitic species, e.g. nematodes of the *Capillaria*, *Skrjabinocapillaria*, *Trichinella* genera (Baldwin et al. 1952, Huizinga et al. 1976, Webb 1980, Mowlavai et al. 2000 – P).

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

X	low
	medium
	high

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

acomm17. Comments:

The species does not affect abiotic factors.

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

	low
X	medium
	high

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

acomm18. Comments:

The influence of this species on the ecosystem integrity is difficult to evaluate. It may be assumed that in some regions, big changes in abundances of birds, reptiles, and amphibians, caused by the mongoose predation, may lead to further changes in ecosystems, connected with the trophic cascade. However, there are no elaborations on the subject. It is known that the small Indian mongoose disturbs functioning of ecosystems in places of its introduction, because it contributes into declines of populations abundances of some bird and mammal species (Roy et al. 2002, Hays and Conant 2007, Watari et al. 2008 – P). In the ecosystems occurring in Poland, the evaluation of the influence of this

species is very uncertain, even assuming that it may survive on the loose. However, it may be supposed that in the worst case scenario, the mongoose invasion would cause hardly reversible changes of processes occurring in habitats which do not belong to habitats of particular care, or easily reversible changes of processes occurring in particular care habitats.

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 small Indian mongoose is a mostly carnivorous species (Pimentel 1955, Vilella 1998, Henderson 1992, Simberloff 2000, Hays and Conant 2007, Hussain et al. 2017 – P); it does not affect plant crops, because its diet includes only a small share of plant food.

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

X	inapplicable
	very low
	low
	medium
	high
	very high

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

acomm20. Comments:

This is an animal species and it cannot compete with plants.

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

X	inapplicable
	no / very low
	low
	medium
	high
	very high

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

acomm21.	Comments: This is an animal species and it cannot crossbreed with plants.

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

X	very low
	low
	medium
	high
	very high

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

acomm22.	Comments: The mongooses does not affect plant crops by disturbance of their integrity.

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

X	very low
	low
	medium
	high
	very high

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

acomm23.	Comments: So far, there is no information on the influence of the small Indian mongoose on plant crops connected with the fact that it is a host or vector of pathogens and parasites harmful for these plants.

A4c | Impact on the domesticated animals domain

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

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

	inapplicable
	very low
	low
	medium
X	high
	very high

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

acomm24.	Comments: In the areas where the mongooses have been introduced, they belong to the most burdensome predators in poultry farms, and they cause damages in the production of these animals (Baldwin et al. 1952 – P). However, there is no exact data on the level of losses caused by mongooses in the majority of the places of the species' introduction. In Puerto Rico and Hawaii, it was estimated that yearly losses connected with public health, poultry

	farm losses, costs of protection of endangered species of birds and reptiles amount to 50 million USD approximately (Pimentel et al. 2005 – P).

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

	very low
X	low
	medium
	high
	very high

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

acomm25. Comments:

The mongooses do not have properties affecting health of a single animal or animal production, which pose a hazard in direct contact, excluding disease transmission and predation. Mongooses infected with rabies are often more aggressive to domestic animals, and cases of mongooses biting dogs and cattle have been described (Everard C.O. and Everard J.D. 1992 – P).

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

	inapplicable
	very low
	low
	medium
	high
X	very high

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

acomm26. Comments:

The small Indian mongoose is a vector of rabies, which is obligatorily notifiable on the basis of veterinary regulations (Baldwin et al. 1952, Everard C.O. and Everard J.D. 1992 – P). In many places, the introduction of mongooses caused an increase in the frequency of rabies with domestic and farm animals (Abdussalam 1959, Everard C.O. and Everard J.D. 1992 – P). The share of infected individuals in the population of mongooses may be very large, e.g. in Puerto Rico, rabies has been found with even 72% of the examined mongooses in years 1986-1990 (Everard C.O. and Everard J.D. 1992 – P), therefore currently mongooses are considered a basic reservoir of this disease in many places (Zieger et al. 2014 – P). Moreover, the mongooses infected with rabies are aggressive, they may attack cattle and sheep, increasing the probability of transmission of this disease onto domestic and farm animals (Everard C.O. and Everard J.D. 1992 – P). Also, mongooses are a host of nematodes of the *Trichinella* genus, which may impact the infection of domestic animals with these parasites (Mowlavai et al. 2000 – P).

A4d | Impact on the human domain

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

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

X	inapplicable
	very low
	low
	medium
	high
	vert high

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

acomm27. Comments:

The species in not parasitic.

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

	very low
X	low
	medium
	high
	very high

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

acomm28. Comments:

The small Indian mongoose is a minute predator, and does not pose a threat for humans in case of direct contact. Only the individuals infected with e.g. rabies may be aggressive towards humans, and cases of biting do occur then (Everard C.O. and Everard J.D. 1992 – P).

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

	inapplicable
	very low
	low
	medium
	high
X	very high

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

acomm29. Comments:

Introduction of the small Indian mongoose often caused an increase in the number of rabies cases with native species in the area colonised by this predator (Everard C.O. and Everard J.D. 1992 – P). Also, it resulted in more frequent rabies infections with humans (Nellis and Everard 1983 – P). The rabies-infected mongooses change their behaviour, cease avoiding contact with humans, and cases of diseased individuals attacking humans do occur (Everard C.O. and Everard J.D. 1992 – P). High densities of mongooses inhabiting environment close to humans (Quinn and Whisson 2005 – P) and aggressive behaviour of these animals increase the rate of rabies spreading. Another mongoose-transmitted disease dangerous for humans is leptospirosis (Nellis and Everard 1983 – P). In some regions, antibodies indicating the presence of *Leptospira* spirochetes are found with even 35% of mongooses. The small Indian mongoose transmits *Bartonella henselae* bacterium as well, which cause an infectious disease bartonellosis with humans, also called cat-scratch disease (Sato et al. 2013 – P). Also, mongooses are a host of nematodes of the *Trichinella* genus, which may increase the risk of infection of humans with these parasites (Mowlavai et al. 2000 – P). In Puerto Rico and Hawaii, it was estimated that yearly losses connected with public health, resulting from disease transmission by mongooses, are relatively large (Pimentel et al. 2005 – P).

A4e | Impact on other domains

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

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

X	very low
	low
	medium
	high
	very high

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

acomm30. Comments:

Despite the fact that the small Indian mongoose often lives in the vicinity of human settlements (Hussajn et al. 2017 – P), it has no adverse impact on the infrastructure, mainly because of its small size and mode of life. However, the mongooses may foul public utilities, such as e.g. parks, with their excrement. Mongooses feeding in urban areas may utilise anthropogenic food, so they may disarrange waste (Sazima 2010 – 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:

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

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

acomm31. Comments:

In the case of increased predation of mongooses in poultry farms, the adverse effect of these predators on farm animals may increase. Transmission of diseases and parasites by mongooses onto domestic and farm animals may cause a decrease in their animal production (Baldwin et al. 1952, Mowlavai et al. 2000 – P).

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

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

aconf28.	Answer provided with a	low	medium **X**	high	level of confidence

acomm32.	Comments: Presence of the small Indian mongoose in ecosystems is causing a higher prevalence of zoonotic diseases, particularly rabies, but also diseases caused by parasites carried by the mongoose (Baldwin et al. 1952, Everard C.O. and Everard J.D. 1992, Mowlavai et al. 2000 – P). The small Indian mongoose disturbs functioning of ecosystems in places of its introduction, because it contributes into declines of populations abundances of some bird and mammal species (Roy et al. 2002, Hays and Conant 2007, Watari et al. 2008 – P).

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

	significantly negative
X	moderately negative
	neutral
	moderately positive
	significantly positive

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

acomm33.	Comments: The mongooses decrease the abundance of game birds significantly, in particular of quails and pheasants (Baldwin et al. 1952 – P). The individuals feeding in urban areas may utilise anthropogenic food, so they may disarrange waste (Sazima 2010 – P).

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

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

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

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

	decrease significantly
	decrease moderately
X	not change
	increase moderately
	increase significantly

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

acomm34.	Comments: The small Indian mongoose originates from southern and south-eastern Asia (Nellis and McManus 1974 – P). In Europe, it has been introduced in Croatia, Bosnia and Herzegovina, and Montenegro (Tvrtković and Kryštufek 1990, Barun et al. 2010, Ćirović et al. 2011 – P). The anticipated climate warming will not cause overcoming geographical barriers and colonising Poland by the small Indian mongoose. The climate warming would have to increase significantly to have an actual influence on the introduction of this species.

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:

In its natural rangeland, the small Indian mongoose inhabits tropical and semitropical zone areas. Climatic conditions in these places are close to those in the natural rangeland of the species. The climate warming rather will not make the climatic conditions in Poland proper for survival of the small Indian mongoose in the environment. The average temperature of January would have increased to 10°C (Nellis and McManus 1974 – P).

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
X	not change
	increase moderately
	increase significantly

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

acomm36. Comments:

Considering the climatic niche of this species (tropical and semitropical zone areas), the climate change will not affect its spreading.

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

	decrease significantly
	decrease moderately
	not change
X	increase moderately
	increase significantly

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

acomm37. Comments:

The influence of the small Indian mongoose on the natural environment does not depend on climate changes.

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	high **X**	level of confidence

acomm38. Comments:

The influence of the small Indian mongoose on plant crops does not depend on climate changes.

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

	decrease significantly
	decrease moderately
	not change
X	increase moderately
	increase significantly

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

acomm39. Comments:

The influence of the small Indian mongoose on animal breeding does not depend on climate changes.

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

	decrease significantly
	decrease moderately
	not change
X	increase moderately
	increase significantly

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

acomm40. Comments:

The influence of the small Indian mongoose on humans does not depend on climate changes.

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 influence of the small Indian mongoose on other objects does not depend on climate changes.

Summary

Module	Score	Confidence
Introduction (questions: a06-a08)	0.00	1.00
Establishment (questions: a09-a10)	0.00	0.75
Spread (questions: a11-a12)	0.00	1.00
Environmental impact (questions: a13-a18)	0.50	0.58
Cultivated plants impact (questions: a19-a23)	0.00	1.00
Domesticated animals impact (questions: a24-a26)	0.67	0.83
Human impact (questions: a27-a29)	0.63	0.75
Other impact (questions: a30)	0.00	1.00
Invasion (questions: a06-a12)	0.00	0.92
Impact (questions: a13-a30)	0.67	0.83
Overall risk score	0.00	
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:
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2. Databases (B)

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3. Unpublished data (N)

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4. Other (I)

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5. Author's own data (A)

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