

Harmonia⁺

a risk-screening procedure
for alien species



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8 Service Public de Wallonie

Contents

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- Conclusion


Introduction

- **risks** of alien organisms : invasive species, pests, emerging diseases...
- the **earlier**, the more (cost-)effective
- Before **prevention** or **early eradication** of these species can take place, it is essential to first **identify** and **prioritize** those species that pose the highest risks.

(rapid) risk-screening procedures

Background

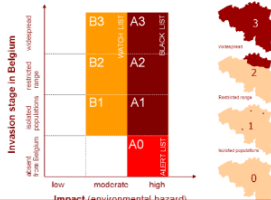
- Branquart (2007) : *Invasive Species Environmental Impact Assessment*
- Successful, but some drawbacks
 - invasion incompletely covered
 - impacts incompletely covered
 - the role of pathogens
 - ...
- ***Alien Alert*** project
 - 2012-11 to 2014-03
 - 8 Belgian institutions
 - <http://ias.biodiversity.be/harmoniaplus>

 **Guidelines for environmental impact assessment and list classification of non-native organisms in Belgium.**
*
Version 2.6 (07/12/2009)

1. Introduction

Harmonia is an information system on non-native invasive species in Belgium, which is developed at the initiative of scientists gathered within the Belgian Forum on Invasive Species (<http://ias.biodiversity.be>). This system aims at collecting standardised information on exotic species which are assumed to be detrimental to native biodiversity in Belgium. It aims to include a high diversity of taxonomic groups from terrestrial, freshwater and marine environments.

Species included in the system are allocated to different list categories based on a simplified environmental impact assessment protocol (ISEIA), and geographic distribution



Harmonia⁺ and Pandora⁽⁺⁾



Harmonia⁺ and Pandora⁺ :

first-line screening tools for
potentially invasive organisms

β version

B. D'hondt, S. Vanderhoeven, S. Roelandt, F. Mayer, V. Versteirt, E. Ducheyne, G. San Martin, J.-C. Grégoire, I. Stiers, S. Quoilin and E. Branquart



Harmonia⁺

a rapid risk-screening
procedure for **invasive
plants & animals**



Pandora⁺

- Sophie Roelandt
- Veerle Versteirt

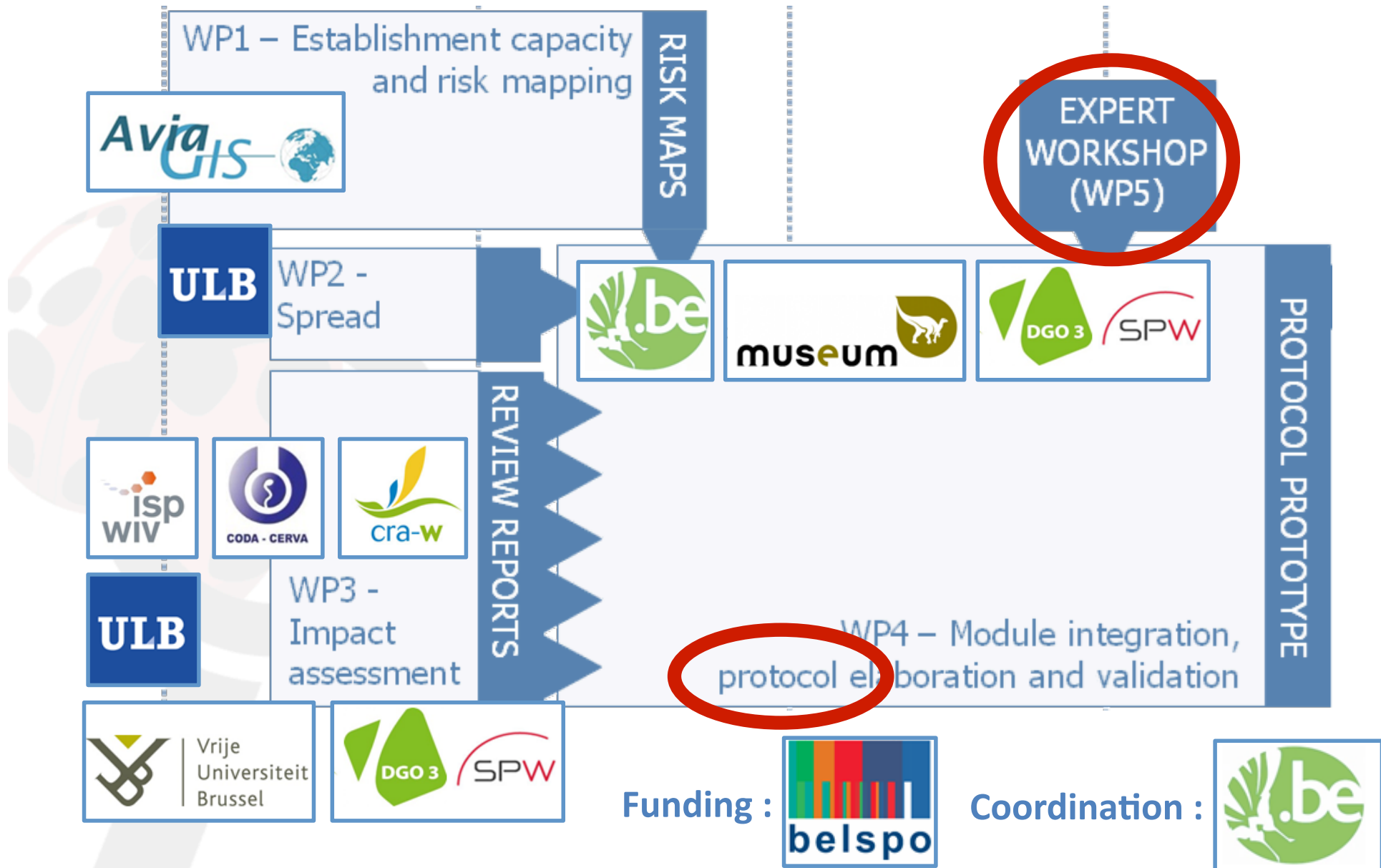


Pandora

a rapid risk-screening
procedure for
pathogens & parasites

<http://ias.biodiversity.be/harmoniaplus>

Realization



Harmonia⁺



D'hondt B, Vanderhoeven S, Roelandt S, Mayer F, Versteirt V, Ducheyne E, San Martin G, Grégoire J-C, Stiers I, Quoilin S, Branquart E. 2014. *Harmonia⁺ and Pandora⁺ : first-line screening tools for potentially invasive organisms - beta version*. Belgian Biodiversity Platform, Brussels, 57 pp.

Harmonia⁺ : structure

- *Harmonia*⁺ ...

- ... basically is a **questionnaire**
- ... is based on a rigid framework for **invasion**
- ... is based on a rigid framework for **risk**

a framework for invasion risk analysis

- ... combines qualitative and quantitative **output**
- ... can be used by **expert panels**

a tool for identification and prioritization



- ... basically is a **questionnaire**
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NOTE: this is a B version (January 2014). The final version is to be launched March 2014 at the latest. • 30 key questions

Harmonia+ - overview

CONTEXT

A1 - Provide the name(s) of the **assessor(s)** : _____

A2 - Provide the name of the **organism** under assessment : _____

A3 - Define the **area** under assessment : _____

A4 - Describe the **status** of the Organism within the Area : _____

A5 - This assessment is considering potential impacts in the _____ domain | the cultivated plants and animals domain | the human (health) domain | (any other domain) : _____

INTRODUCTION

A6 - The probability for *The Organism* to be introduced into *The Area*'s wild by **natural means** is [low | medium | high].

A7 - The probability for *The Organism* to be introduced into *The Area*'s wild by **unintentional human actions** is [low | medium | high].

A8 - The probability for *The Organism* to be introduced into *The Area*'s wild by **intentional human actions** is [low | medium | high].

ESTABLISHMENT

A9 - *The Area* provides [non-optimal | sub-optimal | optimal] **climate** for establishment of *Organism*.

A10 - *The Area* provides [non-optimal | sub-optimal | optimal] **habitat** for establishment of *Organism*.

SPREAD

A11 - *The Organism*'s capacity to disperse within *The Area* by **natural means** is [very low | low | medium | high | very high].

A12 - *The Organism*'s frequency of dispersal within *The Area* by **human actions** is [low | medium | high].

IMPACTS: environmental targets

A13 - *The Organism* has a(n) [inapplicable | low | medium | high] effect on native species through **predation, parasitism or herbivory**.

A14 - *The Organism* has a [low | medium | high] effect on native species, through **competition**.

A15 - *The Organism* has a(n) [no / very low | low | medium | high | very high] effect on native species, through **interbreeding**.

A16 - *The Organism* has a [very low | low | medium | high | very high] effect on native species, by hosting **pathogens or parasites** that are harmful to them.

A17 - *The Organism* has a [low | medium | high] effect on ecosystem integrity, by affecting its **abiotic properties**.

A18 - *The Organism* has a [low | medium | high] effect on ecosystem integrity, by affecting its **biotic properties**.

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A1. Provide the name(s) of the assessor(s) : _____

Abox1. Comments : _____

More info:
Provide a (the) name(s) for the person(s) performing the assessment.

A2. Provide the name of the organism under assessment : _____

Abox2. Comments : _____

More info:
Identify the biological entity under consideration. This can be a genus, species, subspecies or any other taxon. The organism under assessment will henceforth briefly be referred to as '*The Organism*'.
The questionnaire is notably designed to suit multicellular plants and animals. Note that pathogenic or parasitic micro-organisms are covered by the *Pandora*⁽⁺⁾ protocol, the results of which may feed into this assessment.

A3. Define the area under assessment : _____

Abox3. Comments : _____

More info:
Identify the geographic entity under consideration. This can be defined as widely as from the local up to the international level. The area under assessment will henceforth briefly be referred to as '*The Area*'.
Currently, much of the guidance refers to Belgium as *The Area*. When different, it may be necessary to search for analogous information.

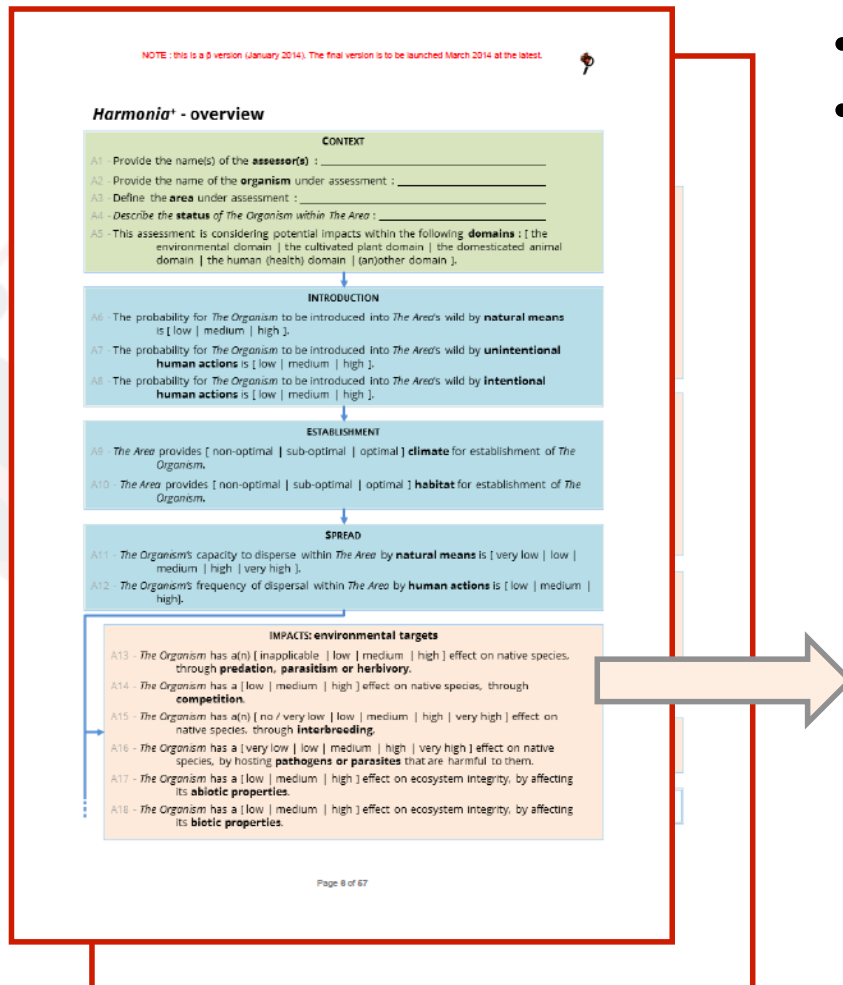
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premise : **some assessor** analyzes the risk for **some organism** in **some area** ...

... basically is a **questionnaire**

- ... is based on a rigid framework for invasion
- ... is based on a rigid framework for risk
- ... combines quantitative and qualitative output
- ... can be used by expert panels

- (3 to 5) *predefined* answers
- level of *confidence*
- textual *comments*



- extensive *guidance* (cf. cut-offs)
- *examples*

A15. *The Organism* has a(n) [no / very low low medium high very high] effect on native species, through **interbreeding**.

Acert11. Answer provided with a [low medium high] level of confidence.

Abox15. Comments : _____

More info:

Indicate whether *The Organism* can locally affect native species through genetic effects, such as hybridisation or introgression (the production of fertile hybrids that backcross with their parents to form hybrid swarms).

Assume that *The Organism* becomes widespread within *The Area*. Then, estimate the likelihood (frequency) for *The Organism* to show interbreeding within the time span of a year, and the consequence of this happening.

Likelihood – Ideally corresponds to the following probabilities. **Low** : 0-33% probability (\approx expected to occur less than once every 3 years). **Medium** : 33-66% (once every 1.5 to 3 years). **High** : 66-100% (more than once every 1.5 years).

Consequence – **Low** : at worst, *The Organism* causes limited losses of genetic integrity in species that are not of conservation concern. **Medium** : at worst, *The Organism* causes severe losses of genetic integrity in species that are not of conservation concern, or limited losses of genetic integrity in species that are of conservation concern. **High** : at worst, *The Organism* causes severe losses of genetic integrity in species that are of conservation concern.

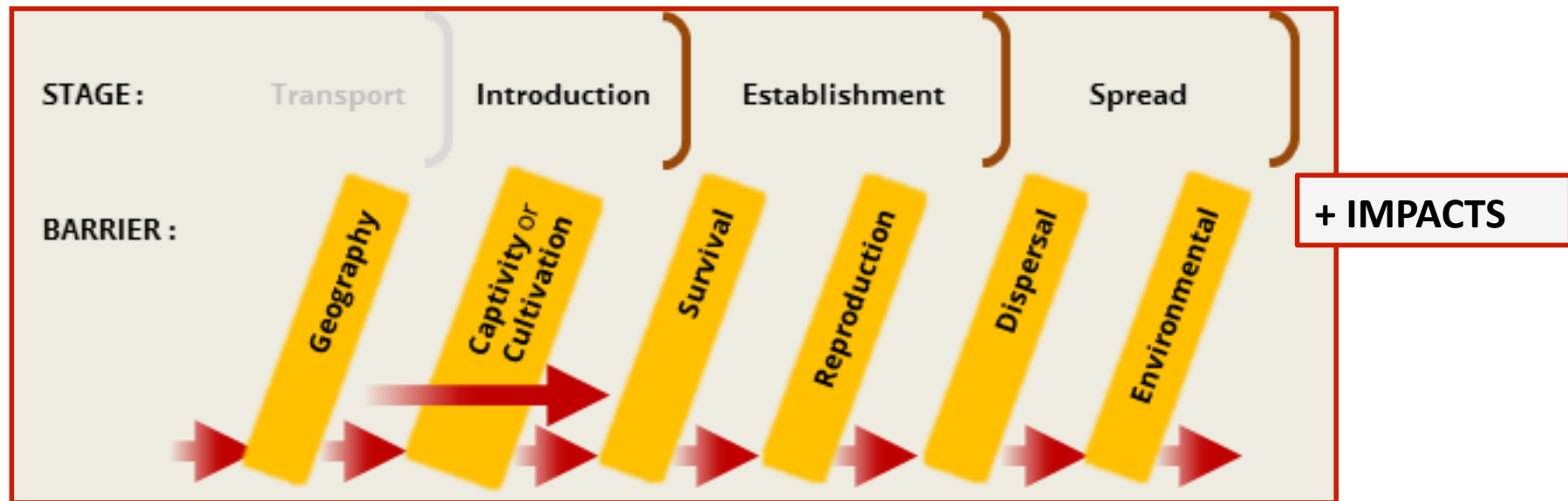
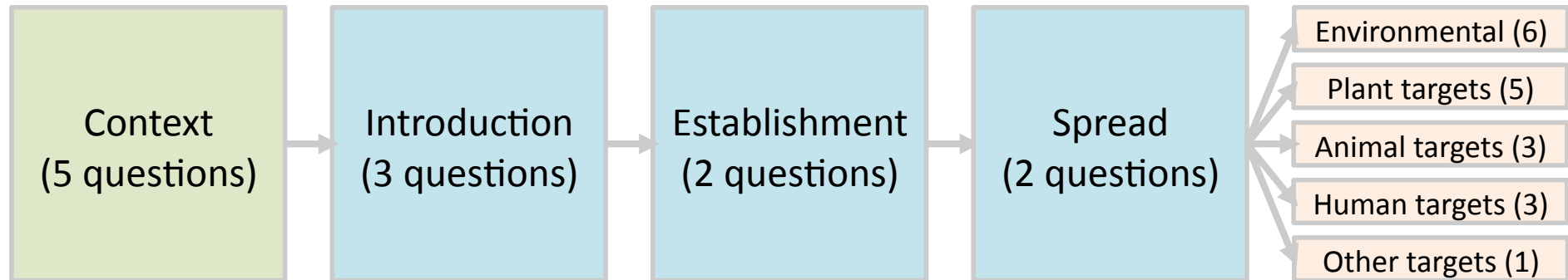
		LIKELIHOOD			LIKELIHOOD x CONSEQUENCE		
		Low	Med	Hgh	VERY LOW	LOW	MEDIUM
CONSEQUENCE	High	Yellow	Orange	Red	Yellow	Orange	Red
	Low	Green	Yellow	Orange	Green	Yellow	Orange

If the likelihood to interbreed is nil, choose **No** as an answer.

Examples

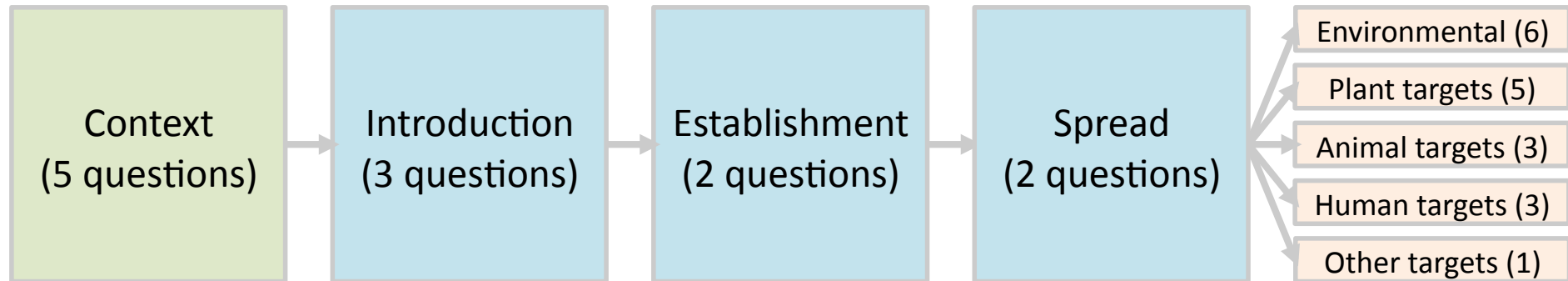
- + The North American beaver (*Castor canadensis*) and Eurasian beaver (*Caster fiber*) are not genetically compatible and cannot interbreed to create a hybrid subspecies (likelihood = nil). – **VERY LOW**
- + Canada geese (*Branta canadensis*) may hybridise with other geese (likelihood = medium), but there are few native breeding geese in Western Europe, and most reported incidences have been with other feral species (consequence = low [GB non-native species secretariat](#) [risk analysis]). – **LOW**

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- ... can be used by **expert panels**



Based on : Blackburn et al. (2011) A proposed unified framework for biological invasions.
Trends in Ecology and Evolution 26 (7): 333-339.

... basically is a **questionnaire**
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- the *environmental domain* refers to *wild animals and plants, habitats and ecosystems*
- the *plant domain* refers to *cultivated plants*
- the *animal domain* refers to *domesticated animals*
- the *human domain* refer to *humans*
- the *other domain* refers to, e.g., *infrastructure*



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$$\text{RISK} = \text{exposure} \times \text{likelihood} \times \text{consequence}$$

Based on : Kinney & Wiruth (1976) Practical risk analysis for safety management. *NWC report*, California.

		LIKELIHOOD		
		Low	Med	Hgh
CONSEQUENCE	Low	Green	Yellow	Orange
	Med	Yellow	Orange	Red
	Hgh	Orange	Red	Dark Red

- Qualitative output
 - *answers* to questions
 - *comments* to answers
 - >> onset of a **detailed risk analysis** (“PRA”)
- Quantitative output
 - answers to questions are converted to *scores*
 - *statistics* on these scores
 - >> ranking for **prioritization**

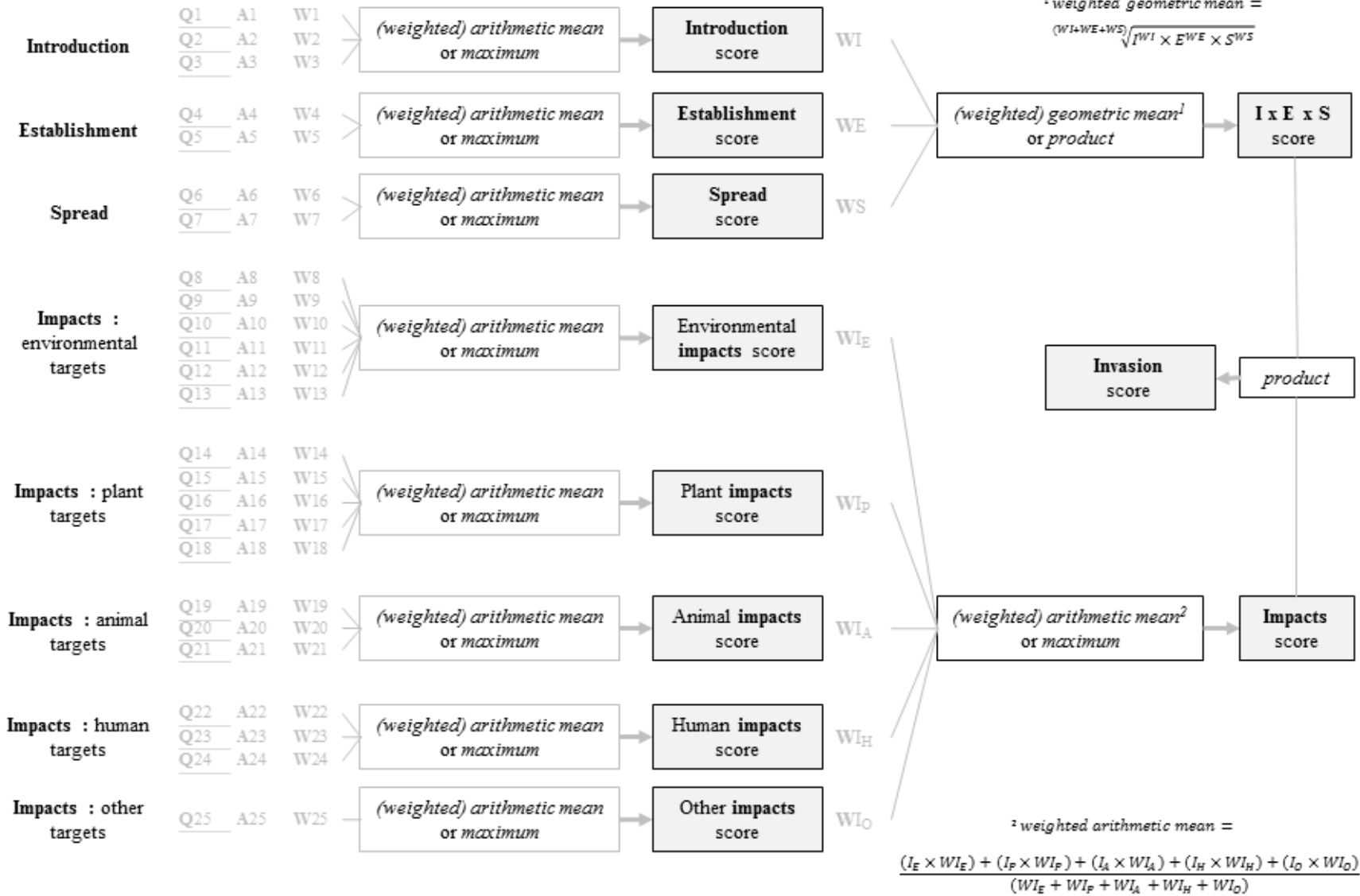
Quantitative output

- scores
 - per module
 - aggregated scores
 - global score
- weighting
 - questions
 - modules
- methods of calculation
 - conceptually reasonable
 - simple



- ... basically is a **questionnaire**
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Q = Question, A = Answer, W = Weight



- use however you like...
- but, process envisioned :



Round of testing



N. Borel

Water primrose
(*Ludwigia grandiflora*)



R. Mutch

American bullfrog
(*Lithobates catesbeianus*)



J.C. Schou

Raccoon dog
(*Nyctereutes procyonoides*)



wikipedia

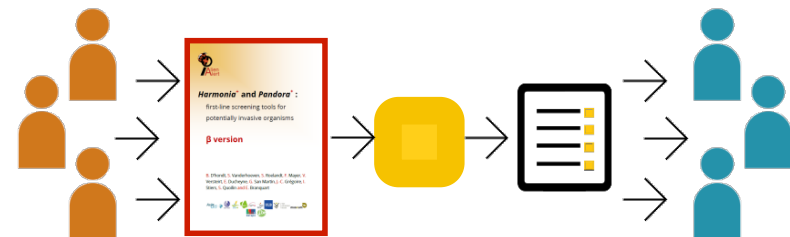
Louisiana crayfish
(*Procambarus clarkii*)



V. Onishchenko

Sacred ibis
(*Threskiornis aethiopica*)

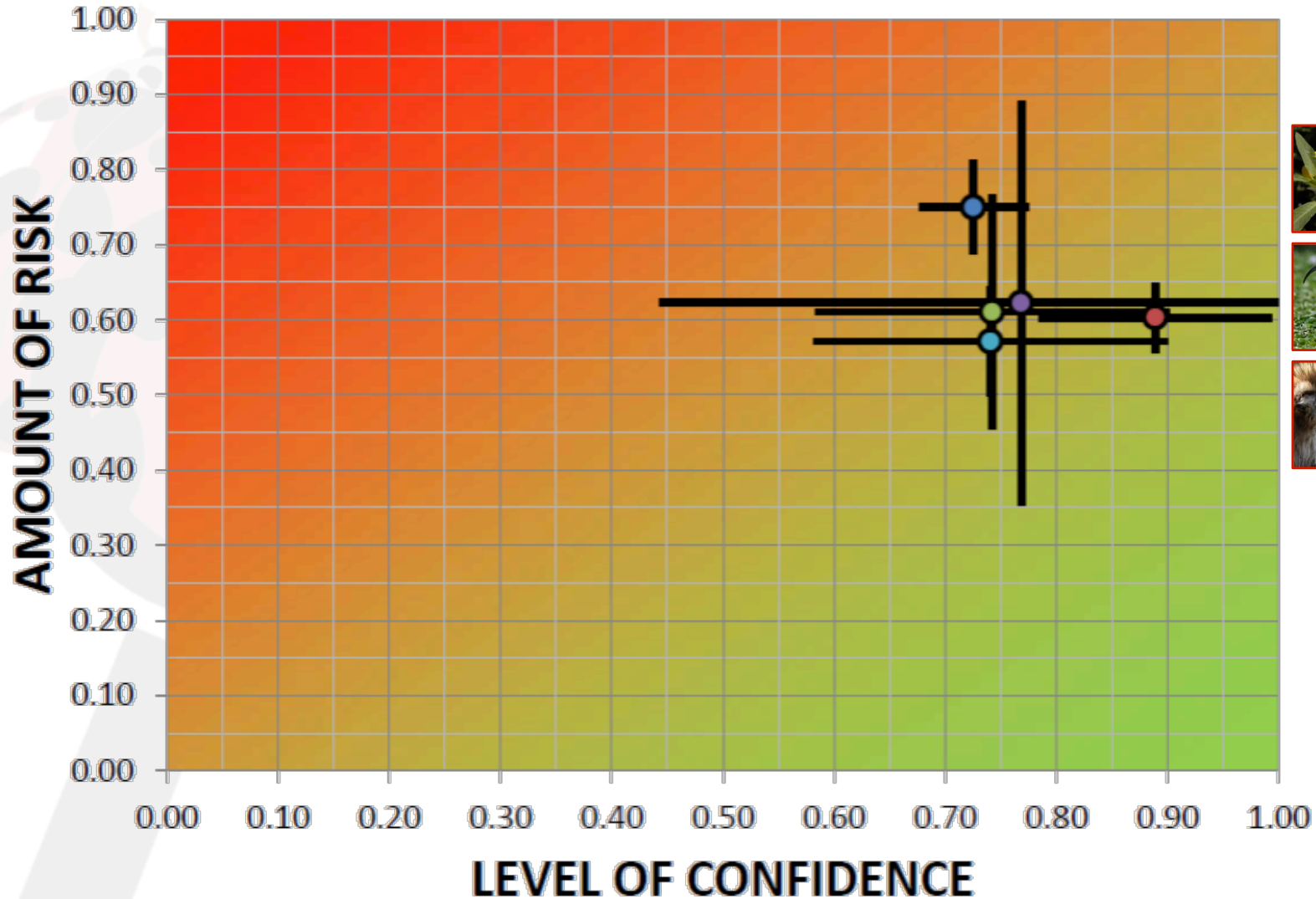
- 5 species
- 3 experts per species
- but incomplete process



Round of testing

INTRODUCTION x ESTABLISHMENT x SPREAD

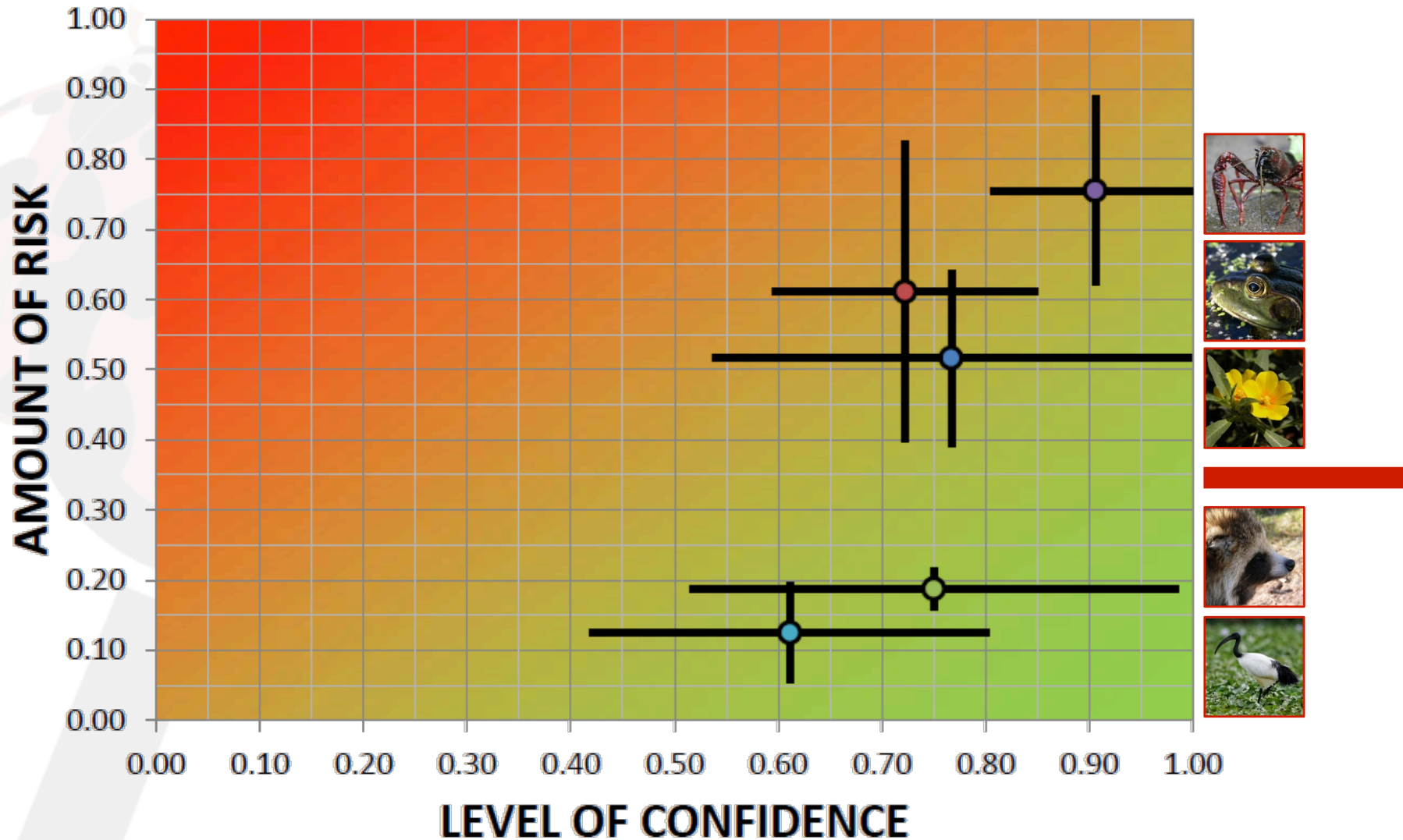
WEIGHTS equal, METHODS default, AVERAGE values +/- STDEV



Round of testing

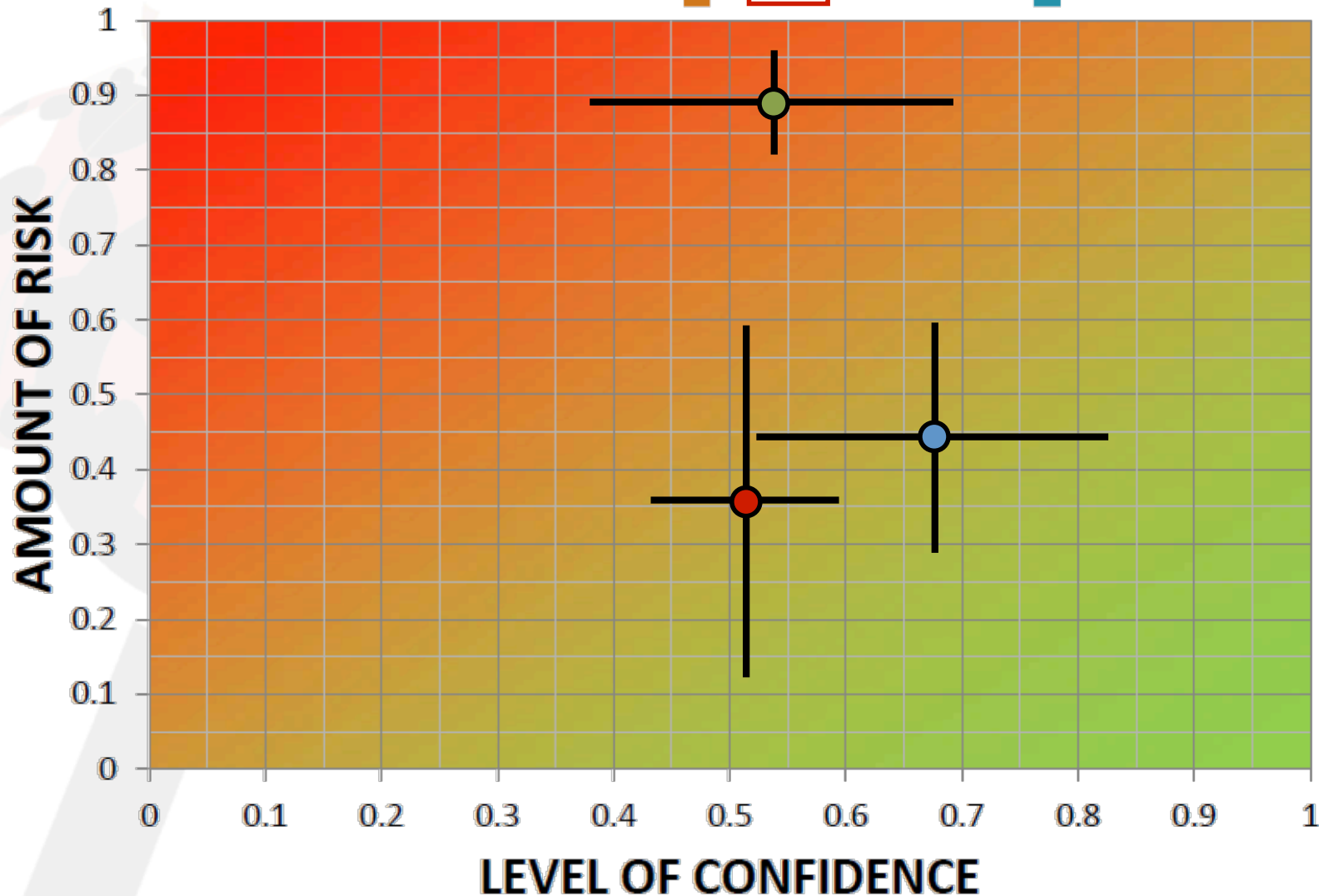
ENVIRONMENTAL impacts

WEIGHTS equal, METHODS default, AVERAGE values +/- STDEV

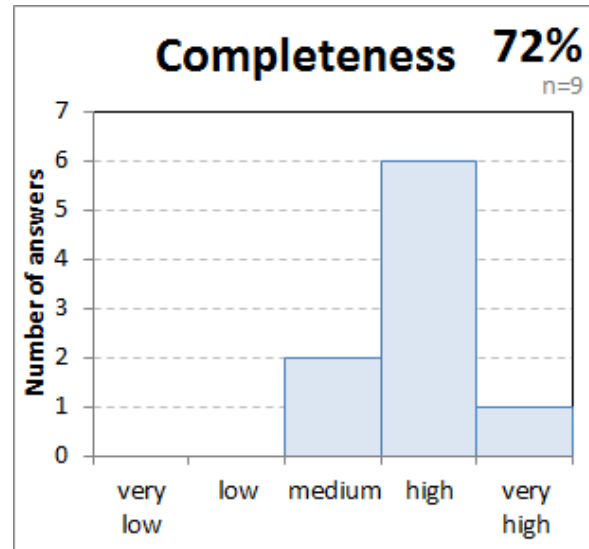
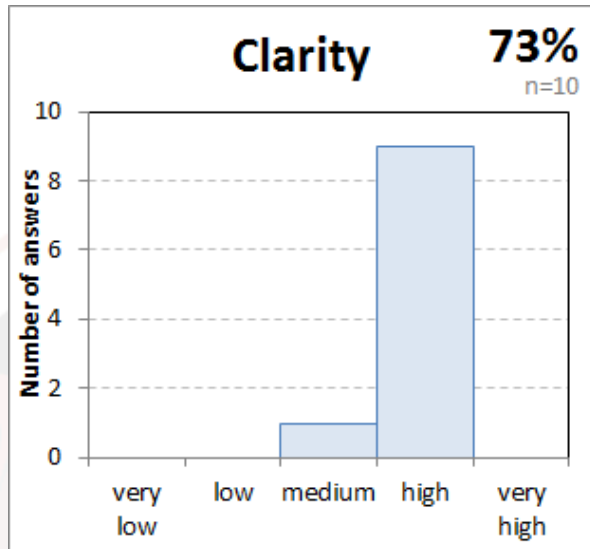


Incomplete process...

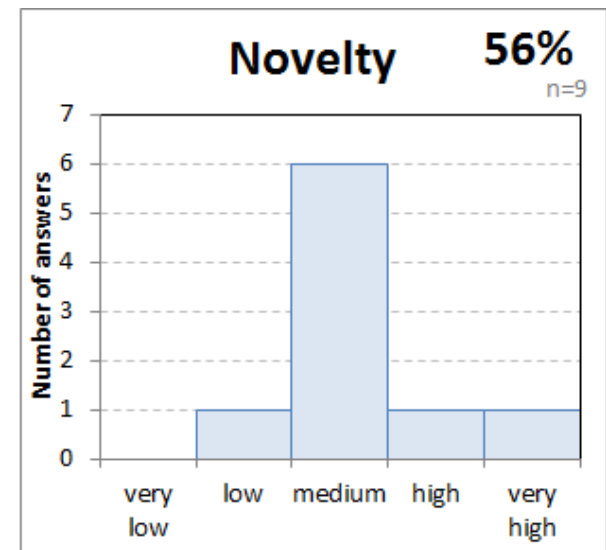
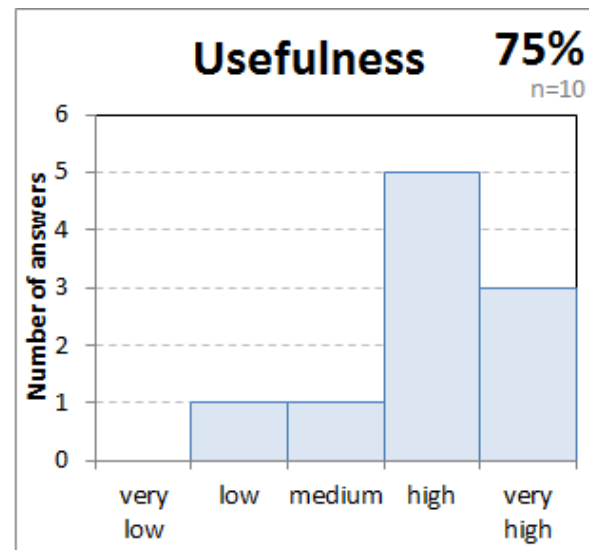
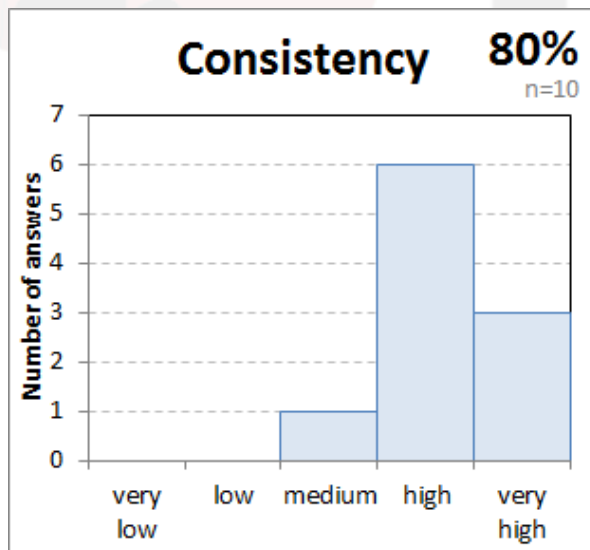
- consensus scores



Survey



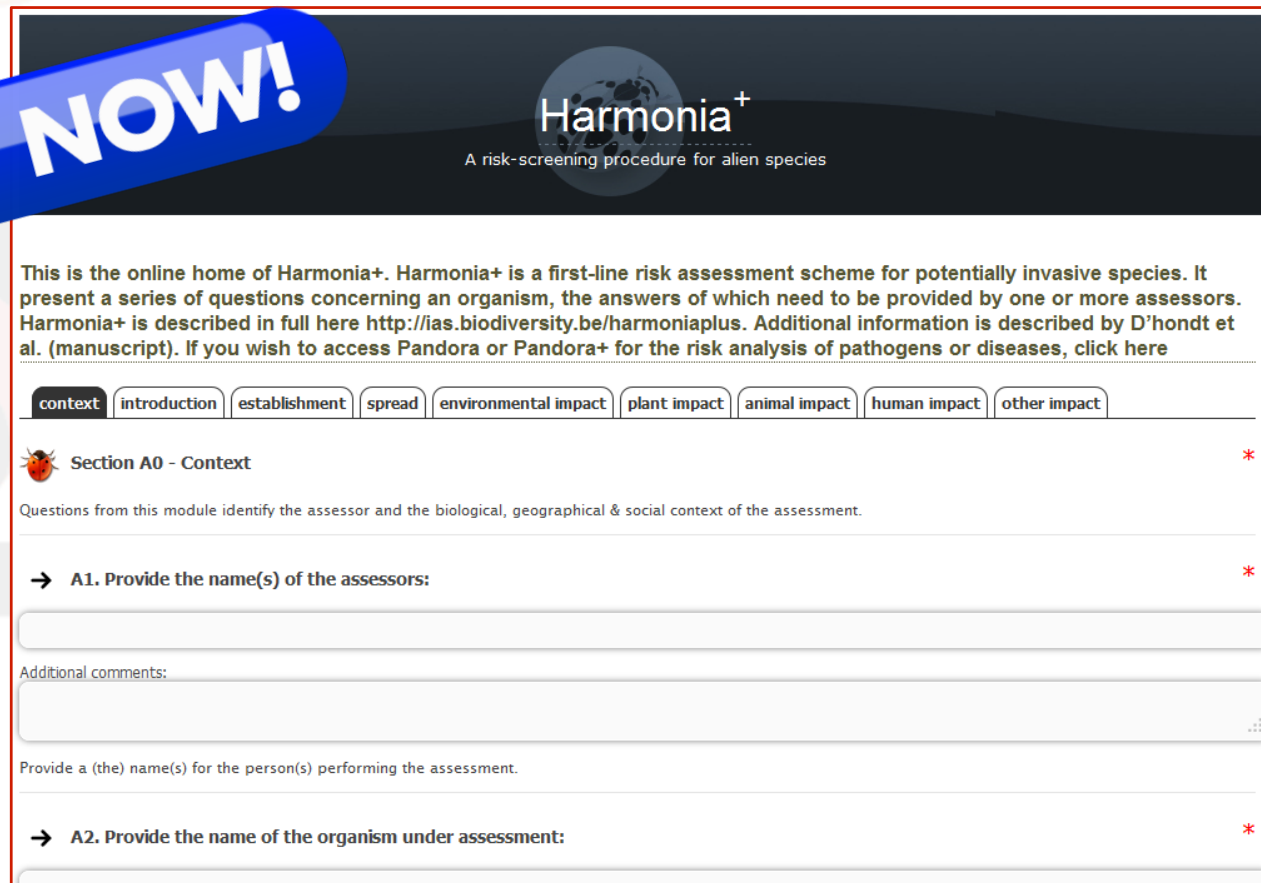
- anonymous, online survey (SurveyMonkey)
- clear, complete, consistent and useful
- medium novelty



Use

- pdf form : <http://ias.biodiversity.be/harmoniaplus>
- online form : <http://home.bebif.be/aa/3baba7>

TRY IT NOW!




The screenshot shows the online interface for Harmonia+, a risk-screening procedure for alien species. The header features the logo and the text "Harmonia+ A risk-screening procedure for alien species". Below the header, there is a navigation menu with tabs for "context", "introduction", "establishment", "spread", "environmental impact", "plant impact", "animal impact", "human impact", and "other impact". The "context" tab is selected. The main content area is titled "Section A0 - Context" and includes a red asterisk indicating a required section. The text below the title reads: "Questions from this module identify the assessor and the biological, geographical & social context of the assessment." There are two main questions: "A1. Provide the name(s) of the assessors:" and "A2. Provide the name of the organism under assessment:", both marked with red asterisks. Each question has a corresponding text input field. Below the first question, there is an "Additional comments:" section with a text area and a small icon in the bottom right corner. The background of the interface is dark with a globe icon.

Harmonia⁺
A risk-screening procedure for alien species

This is the online home of Harmonia+. Harmonia+ is a first-line risk assessment scheme for potentially invasive species. It present a series of questions concerning an organism, the answers of which need to be provided by one or more assessors. Harmonia+ is described in full here <http://ias.biodiversity.be/harmoniaplus>. Additional information is described by D'hondt et al. (manuscript). If you wish to access Pandora or Pandora+ for the risk analysis of pathogens or diseases, [click here](#)

context introduction establishment spread environmental impact plant impact animal impact human impact other impact

 **Section A0 - Context** *

Questions from this module identify the assessor and the biological, geographical & social context of the assessment.

→ **A1. Provide the name(s) of the assessors:** *

Additional comments:

Provide a (the) name(s) for the person(s) performing the assessment.

→ **A2. Provide the name of the organism under assessment:** *

Conclusion

- **Harmonia⁺** ...
 - ... is a **(rapid) risk-screening procedure** for plants and animals
 - ... is realized through an **inter-disciplinary collaboration**
 - ... is considered **complete, clear and consistent**
 - ... can be used in **multi-expert** assessments
- ... thus allows to **prioritize species** for measures of **prevention** and **early eradication**
- ... is **out there** !

Acknowledgements

- Workshop experts : Tim Adriaens, Sarah Brunel, Gordon Copp, Guillaume Fried, Lisbeth Harm Nielsen, Marc Kenis, Wiebe Lammers, Martine Maes, Isabelle Mandon, Laurence Marrama, Xavier Mestdagh, Niall Moore, Helen Roy, Tony Sainsbury, Diederik Strubbe, Paul Tavernier, Tom van der Have, Marjan Van Esbroeck, Alfons Van Gompel, Johan van Valkenburg, Laura Verbrugge
- Test assessors : Carles Aranda, Isabelle Behaeghel, Nick Berkvens, Pieter Boets, Celia Boone, Marieta Braks, Roger Cammaerts, Thibaut Delsinne, Luc Denys, Gerald Louette, An Martel, Estelle Meroc, Jean-Yves Paquet, Frank Pasmans, Yvon Perrin, Henri Robert, Vinciane Schockert, Yves Van der Stede, Valerie Vandenberghe, Sarah Welby, Wim Wesemael
- Organization : Angélique Berhault, Aline van der Werf, Belgian Biodiversity Platform team