Harmonia+

a risk-screening procedure for alien species

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1 **Belgian Biodiversity Platform**, 2 Veterinary and Agrochemical Research Centre, 3 Université Libre de Bruxelles, 4 Avia-GIS, 5 Walloon Agricultural Research Centre, 6 Vrije Universiteit Brussel, 7 Belgian Scientific Institute for Public Health, 8 Service Public de Wallonie

Contents

- Introduction
- Realization
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- Conclusion

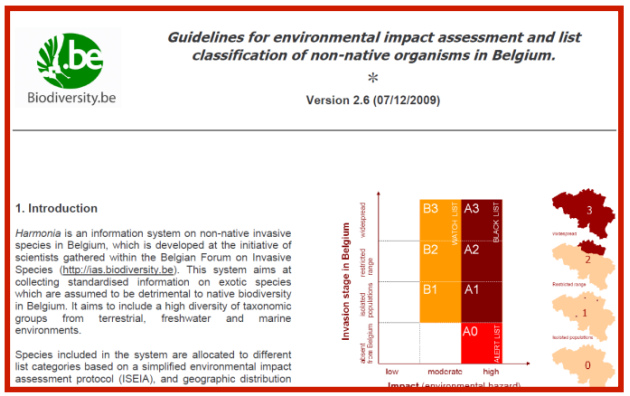
Introduction

- **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*
- Succesful, 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


Biodiversity.be

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.

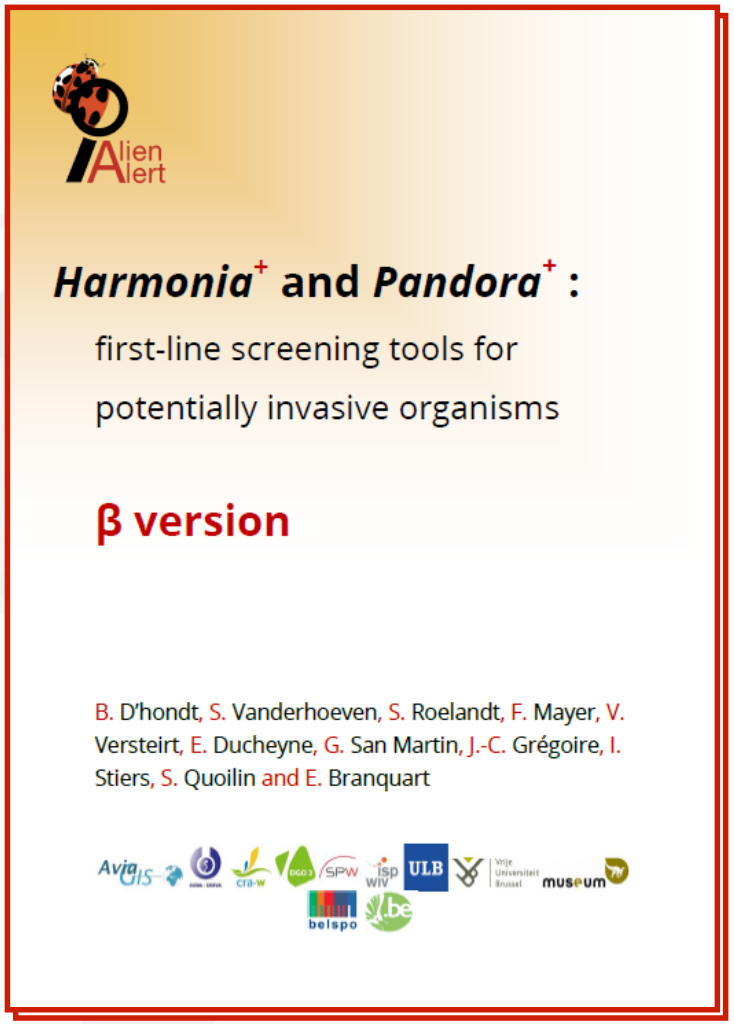
Species included in the system are allocated to different list categories based on a simplified environmental impact assessment protocol (ISEIA), and geographic distribution

Invasion stage in Belgium

B3 A3 B2 A2 B1 A1 A0

low moderate high

Harmonia^{+} and *Pandora*$^{(+)}$



Harmonia^{+}

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

Pandora^{+}

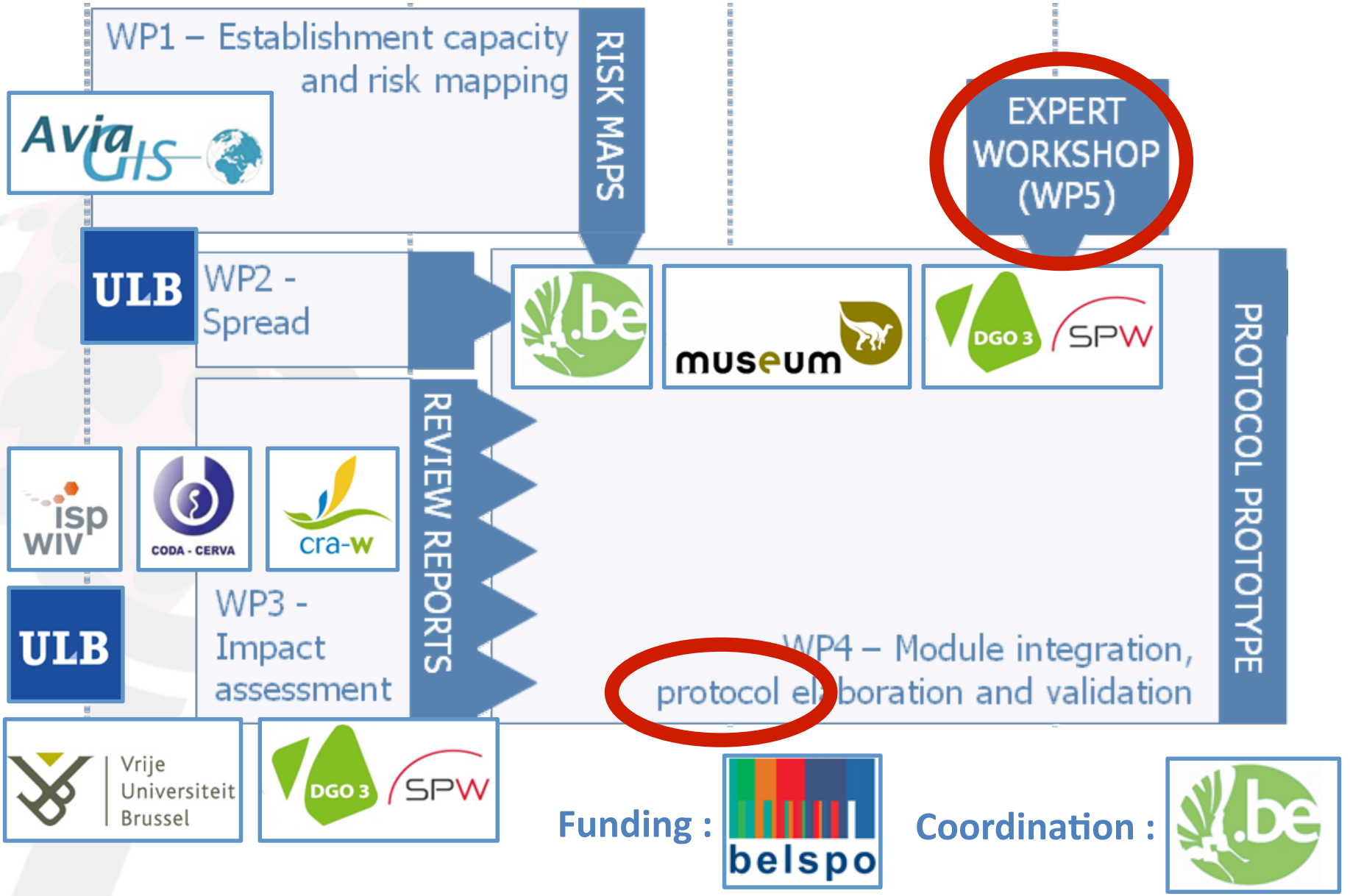
- Sophie Roelandt
- Veerle Versteirt

Pandora

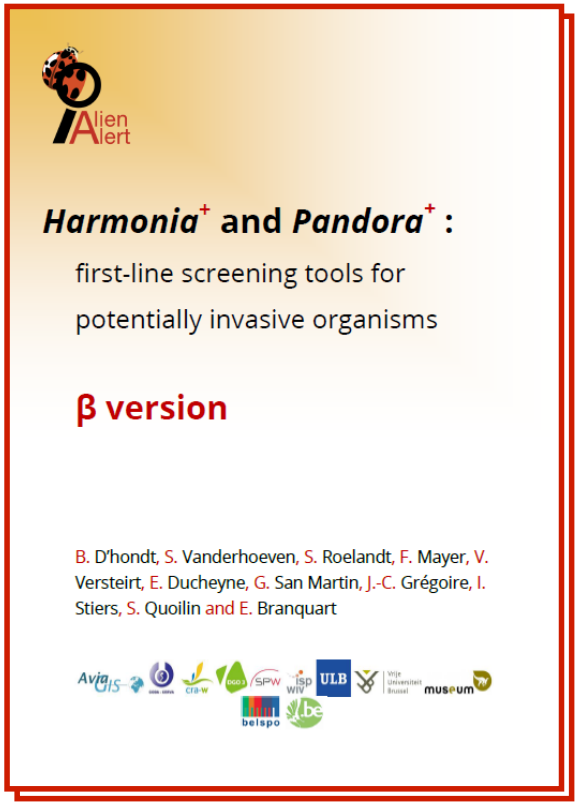
a rapid risk-screening procedure for **pathogens & parasites**

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**

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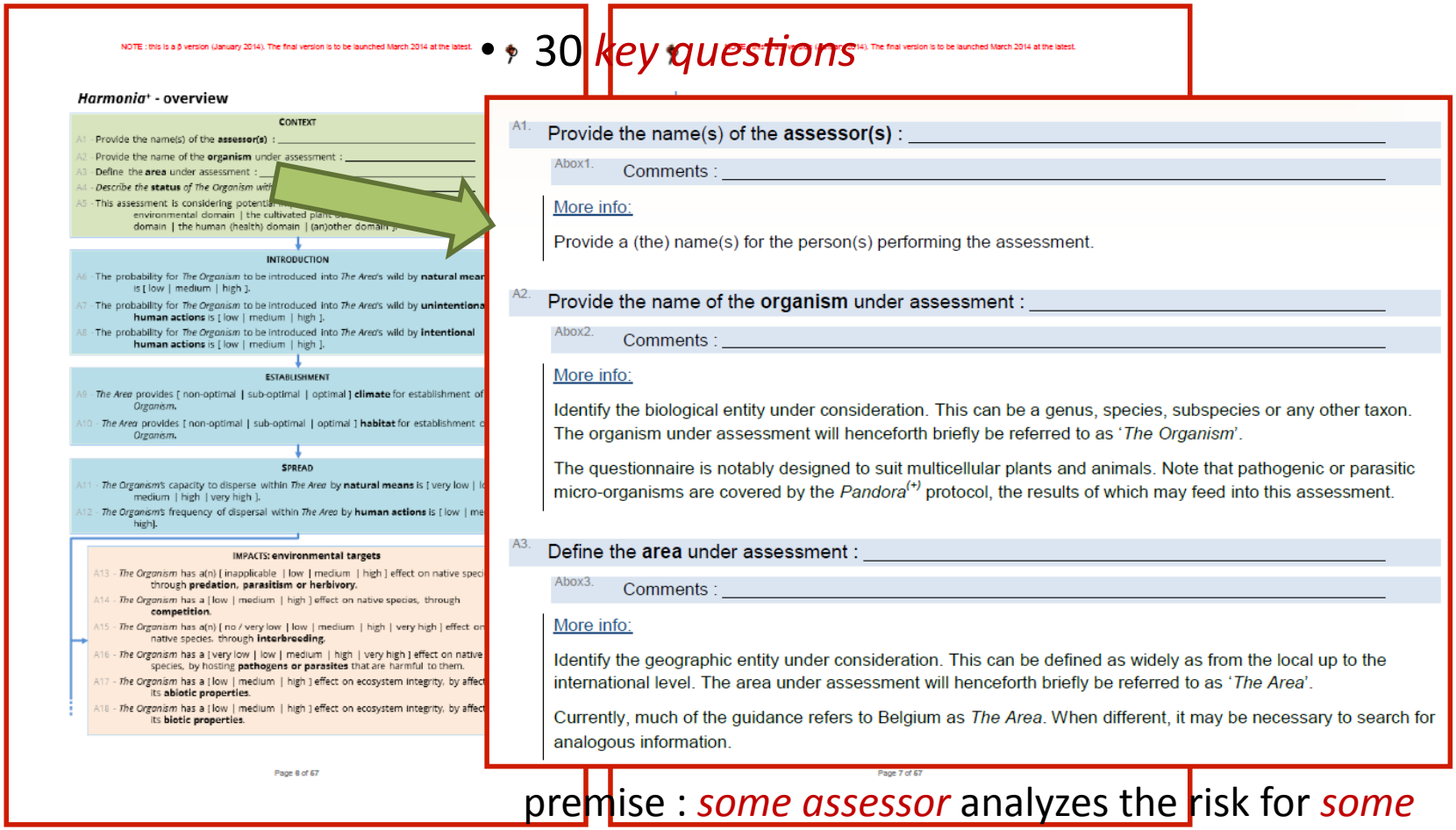

- 30 *key questions*

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

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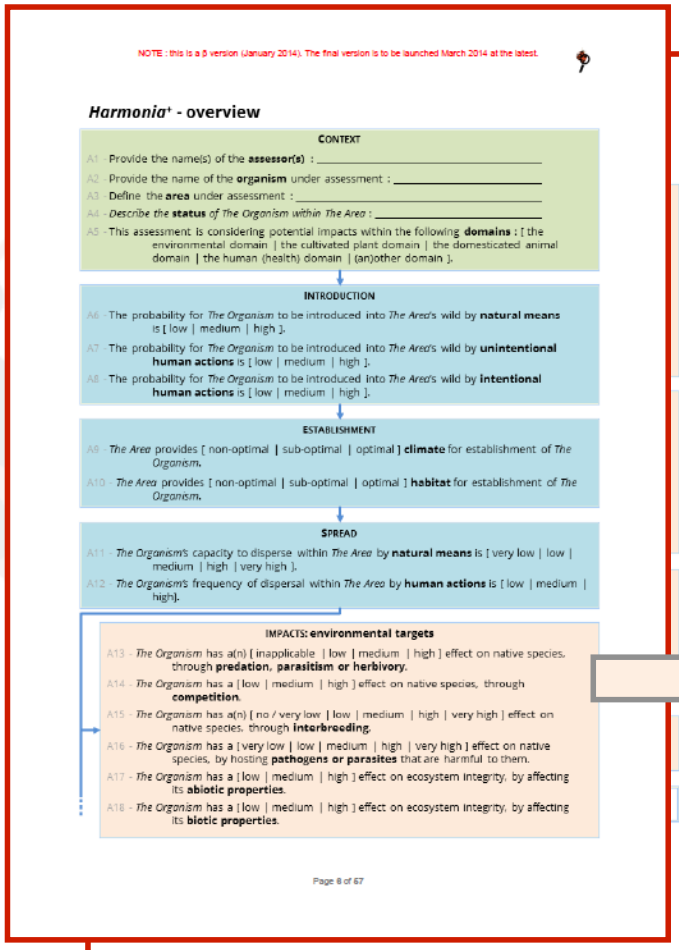

NOTE : this is a β version (January 2014). The final version is to be launched March 2014 at the latest.

***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 within the following **domains** : [the environmental domain | the cultivated plant domain | the domesticated animal domain | the human (health) domain | (an)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 *The Organism*.

A10 - *The Area* provides [non-optimal | sub-optimal | optimal] **habitat** for establishment of *The 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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- extensive *guidance* (cf. cut-offs)
- *examples*

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

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 : _____

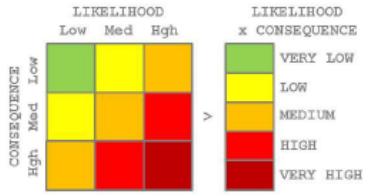
More info:

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 (≈ 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.



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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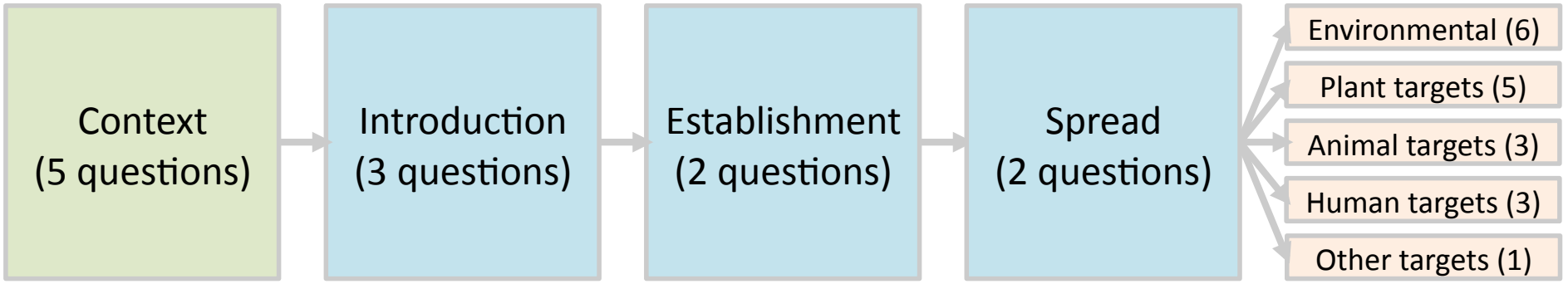

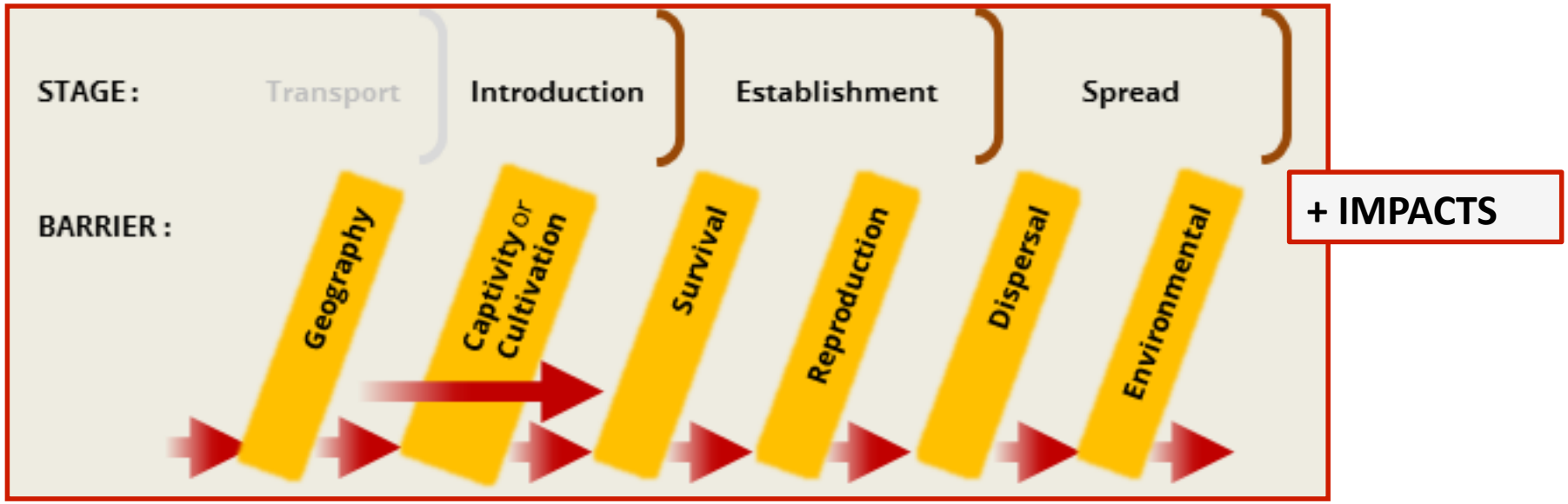

Based on : Blackburn et al. (2011) A proposed unified framework for biological invasions. *Trends in Ecology and Evolution* 26 (7): 333-339.

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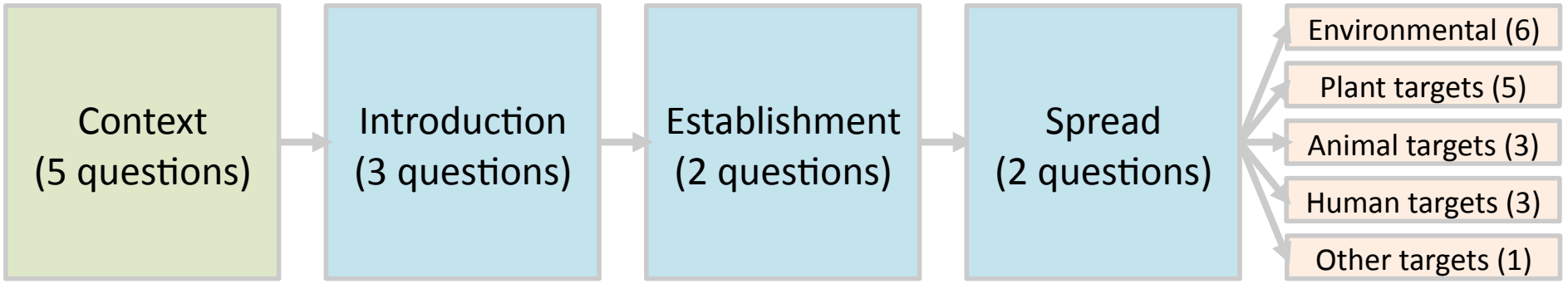

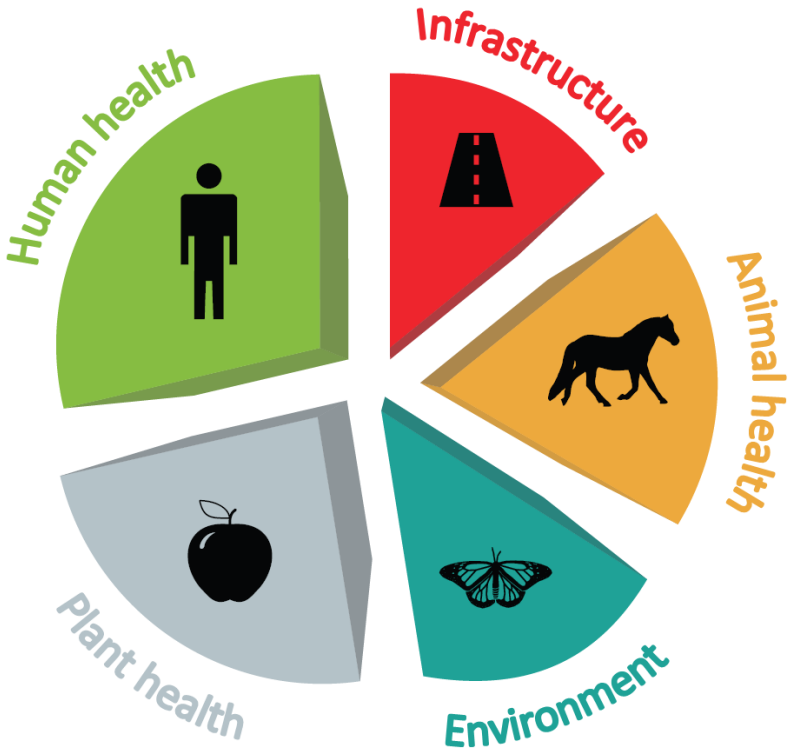

- the *environmental domain* refers to *wild animals and plants, habitats and ecosystems*
- the *plant domain* refers to *cultivated plants*
- the *animal domain* refers to *domesticated animals*
- the *human domain* refer to *humans*
- the *other domain* refers to, e.g., infrastructure

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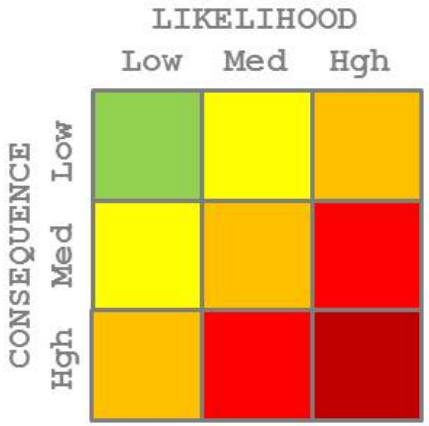
RISK = **exposure** x **likelihood** x **consequence**

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



- 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

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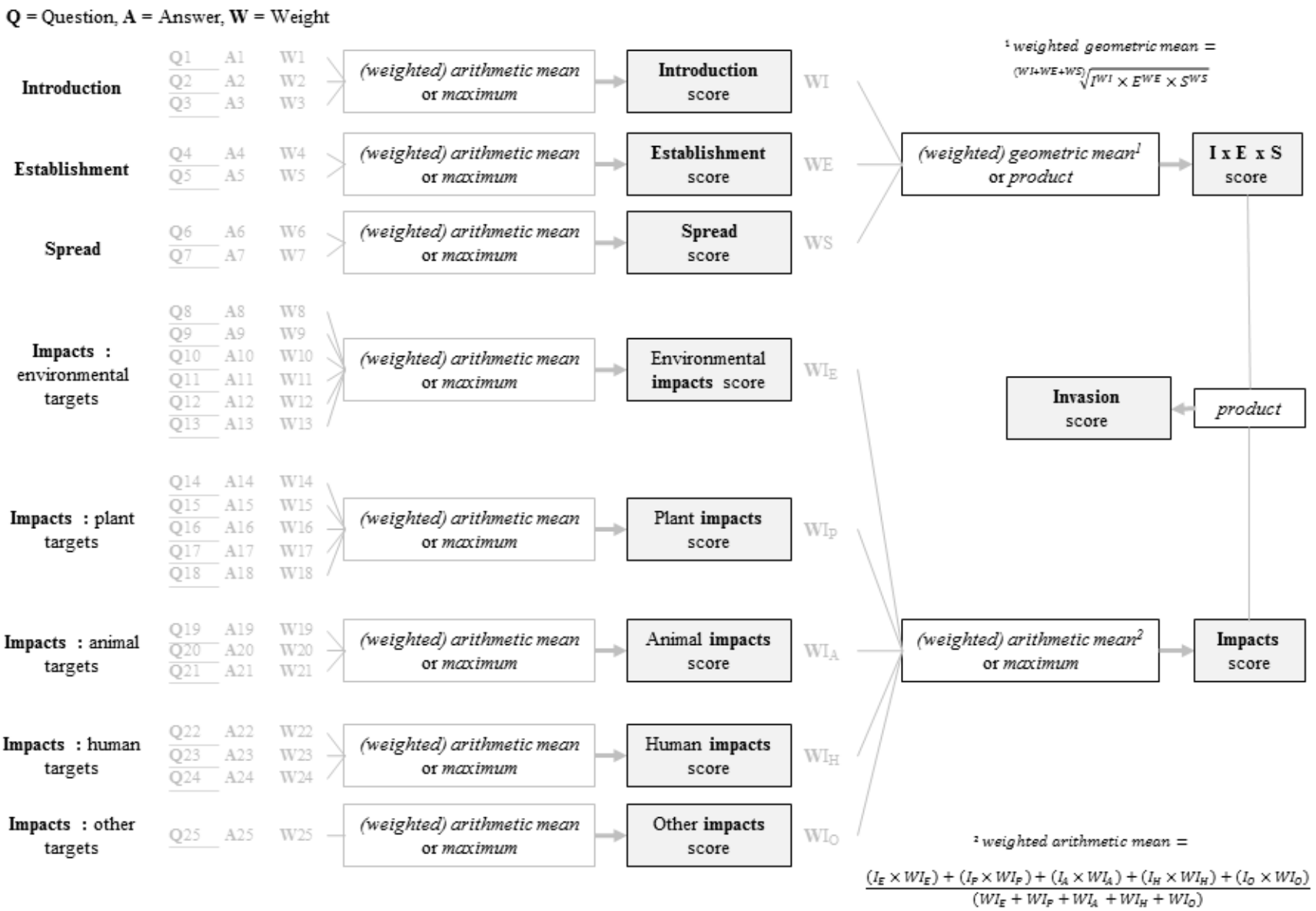

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- use however you like…
- but, process envisioned :

Round of testing

N. Borel

Water primrose (*Ludwigia grandiflora*)

R. Mutch

American bullfrog (*Lithobates catesbeianus*)

J.C. Schou

Raccoon dog (*Nyctereutes procyonoides*)

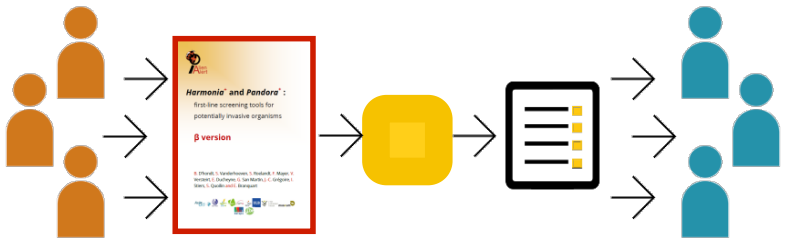
wikipedia

Louisiana crayfish (*Procambarus clarkii*)

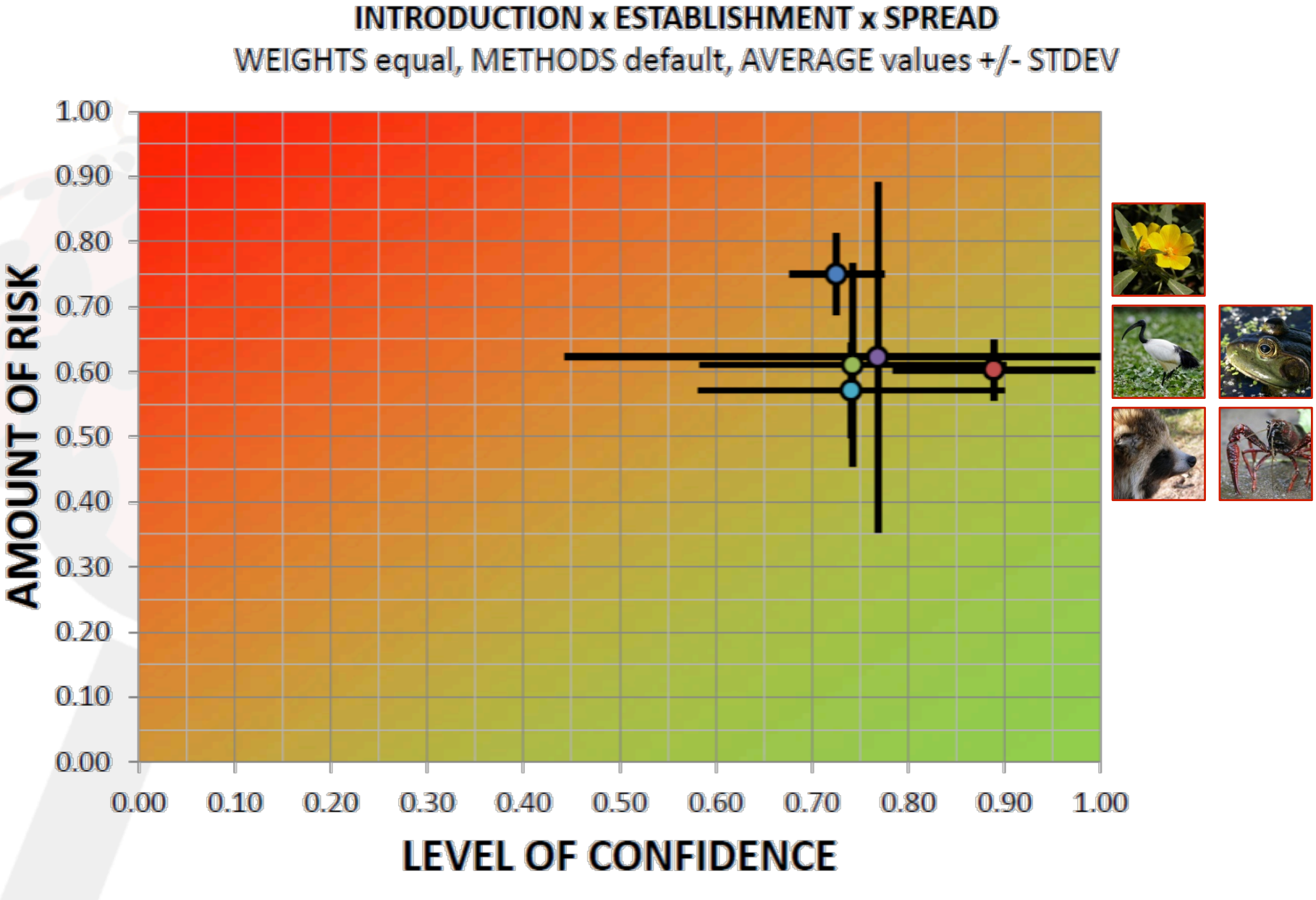
V. Onishchenko

Sacred ibis (*Threskiornis aethiopica*)

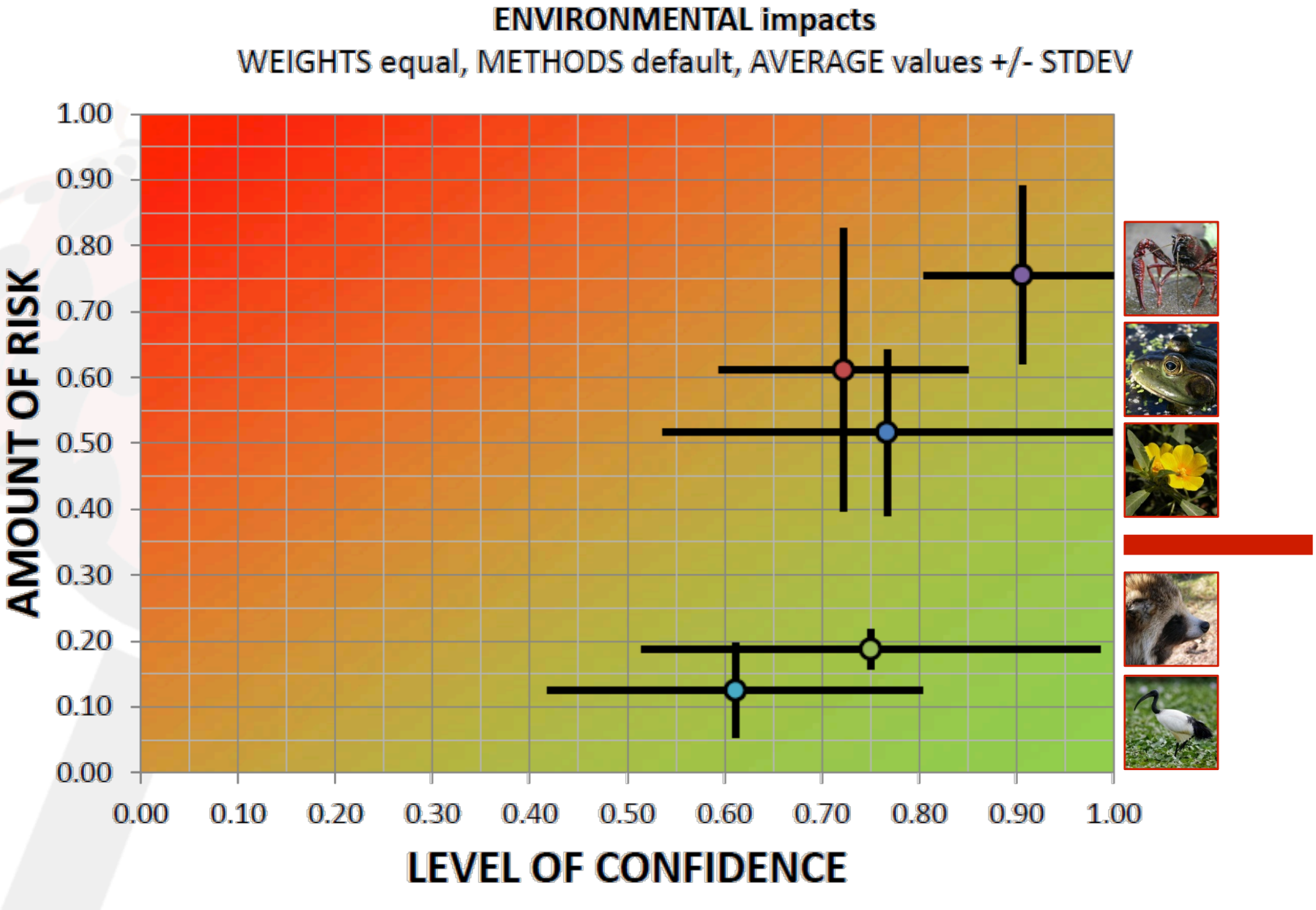
- 5 species
- 3 experts per species
- but incomplete process



Round of testing

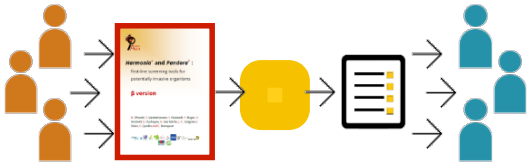


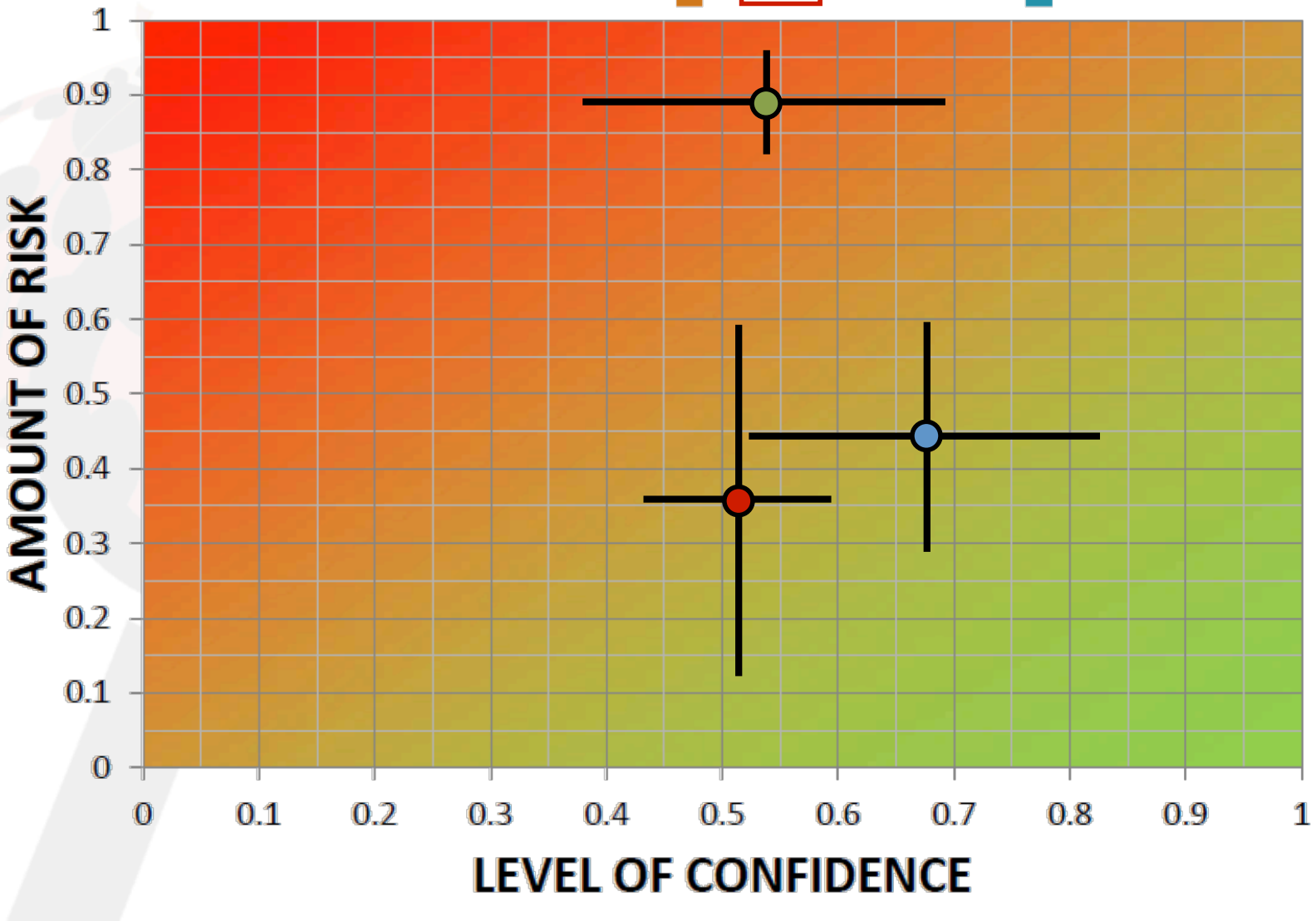
Round of testing



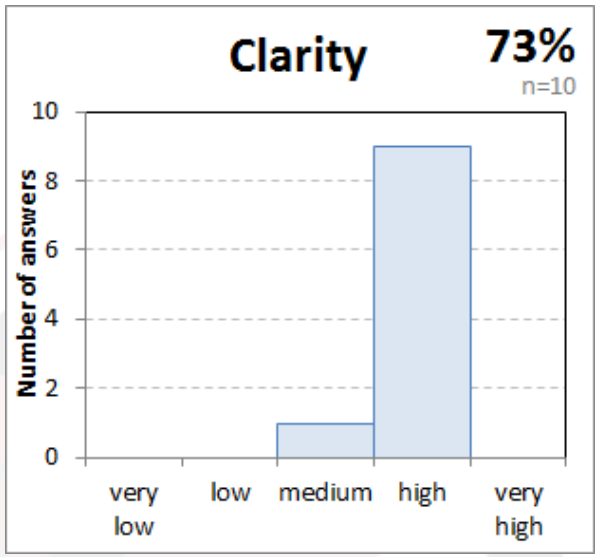
Incomplete process…

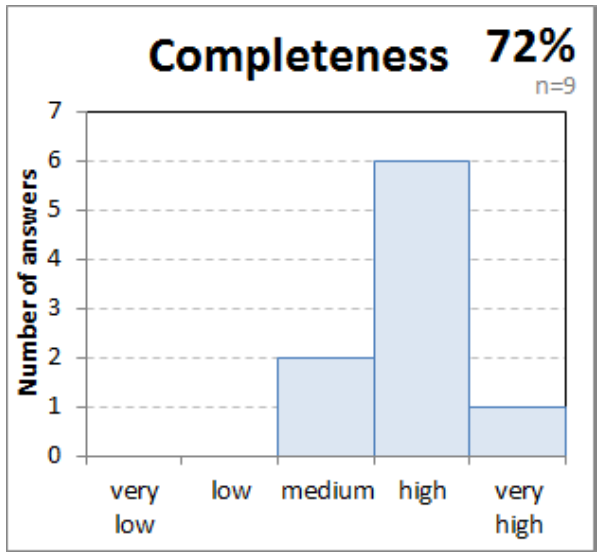
- consensus scores



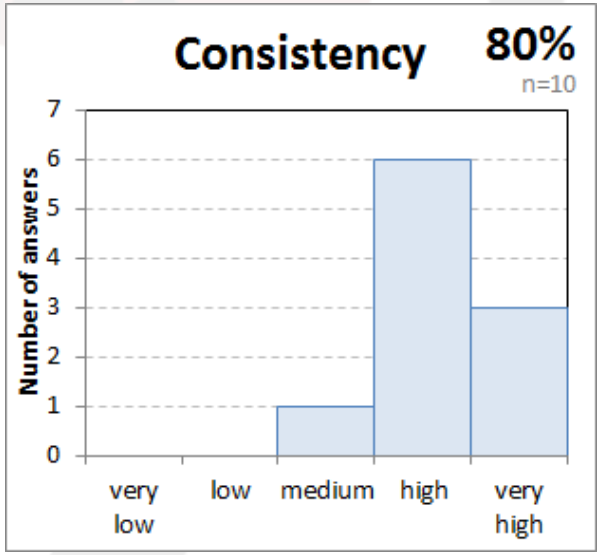


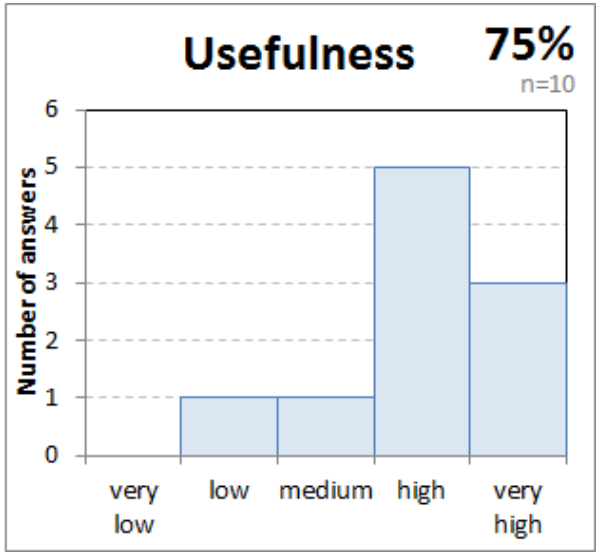
Survey

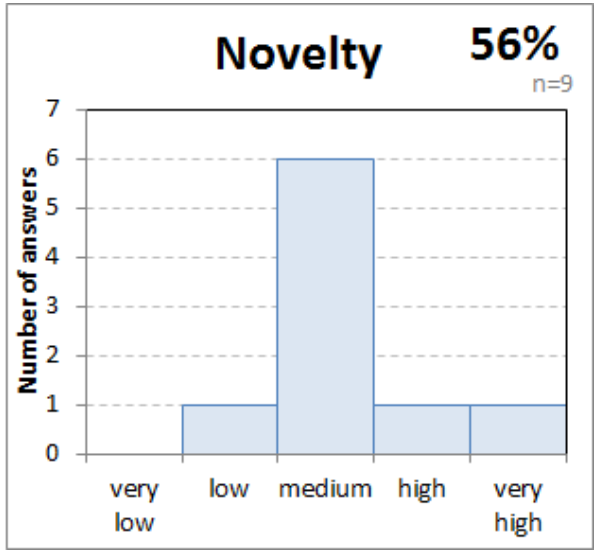




- anonymous, online survey (SurveyMonkey)
- clear, complete, consistent and useful
- medium novelty

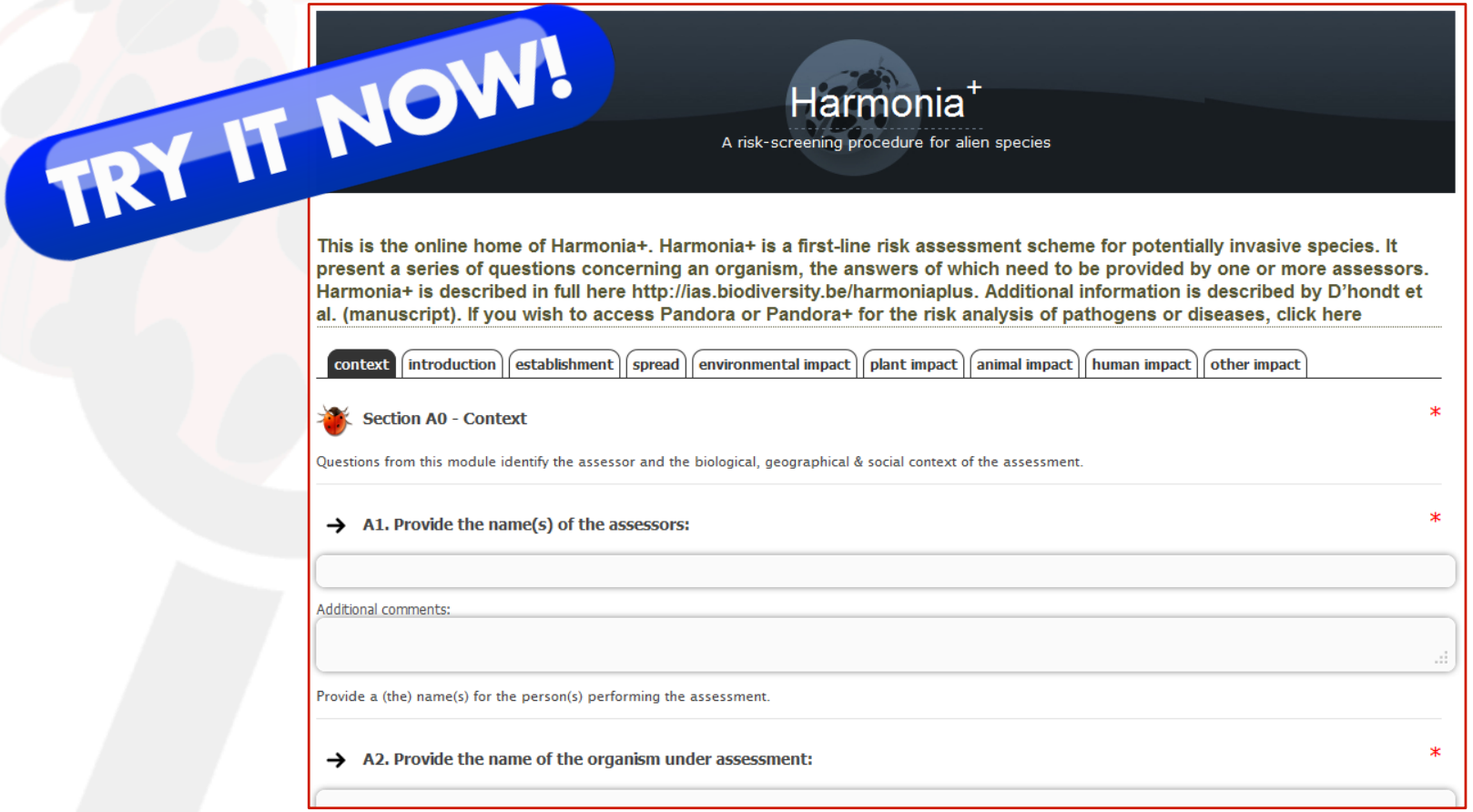






Use

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



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

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