

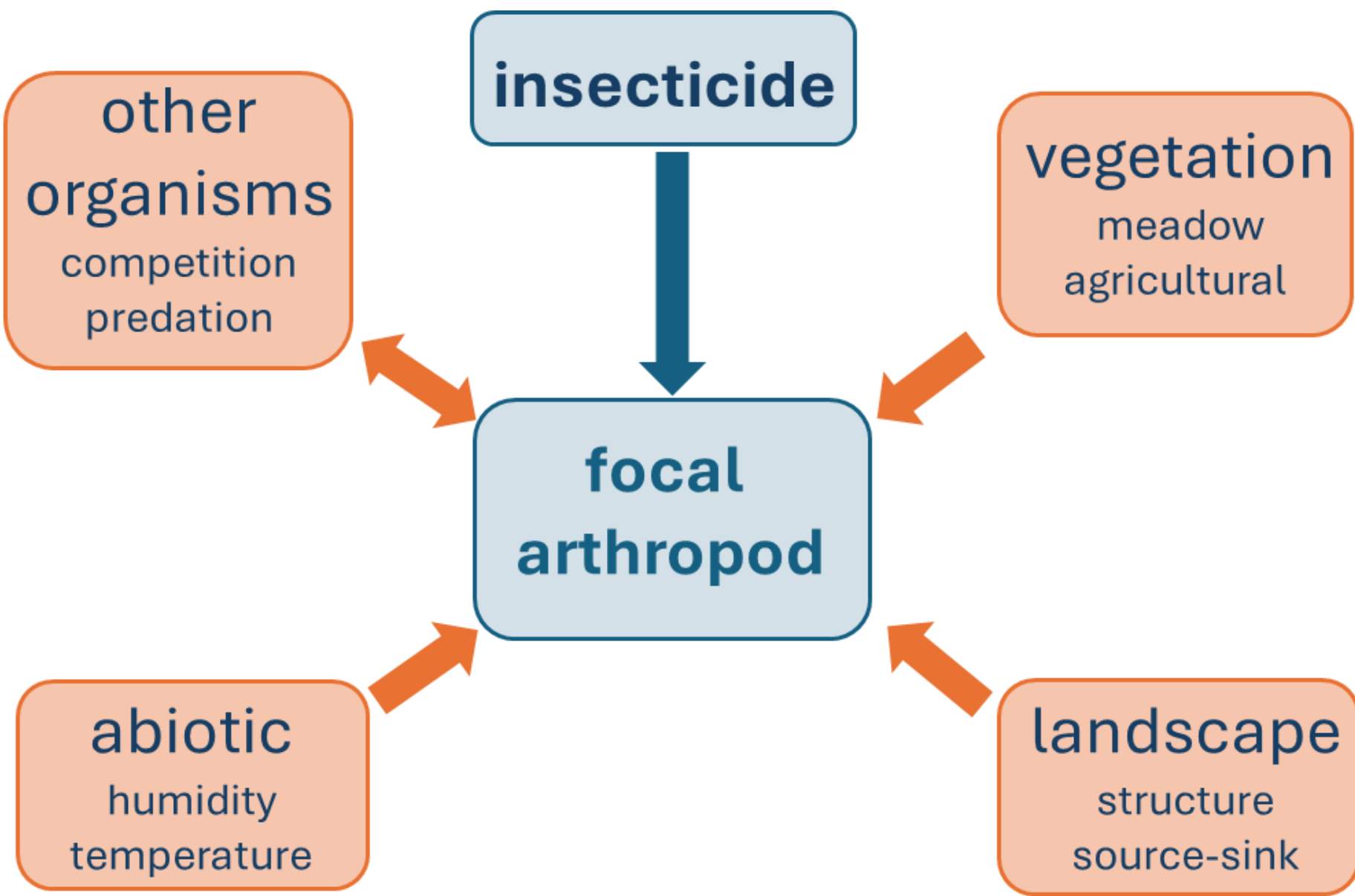
Non-Target Arthropods: Differences in Sensitivity to Pesticide Treatment In-Field vs. Off-Crop?

Melanie Hagen-Kissling*, Livia De Felici, Julia Friman, Bogdan Dehelean

Eurofins MITOX, Amsterdam, The Netherlands, *melanie.hagen@as.eurofinseu.com

Introduction

Higher tier NTA studies measure the responses of local communities to the exposure of a plant protection product (PPP) in highly complex natural systems in contrast to lower tier lab studies, where experiments are conducted under predefined conditions. Natural systems are complex, and NTA communities are shaped by biotic and abiotic factors, which increase the variability in the system. Consequently, several factors could influence the response of the arthropods to the pesticide exposure. Habitat structure and condition (e.g., vegetation cover), abiotic factors (e.g., temperature, humidity), exposure routes and the biology of the arthropods (e.g., habitat preference, feeding strategy) could affect such differences in response.

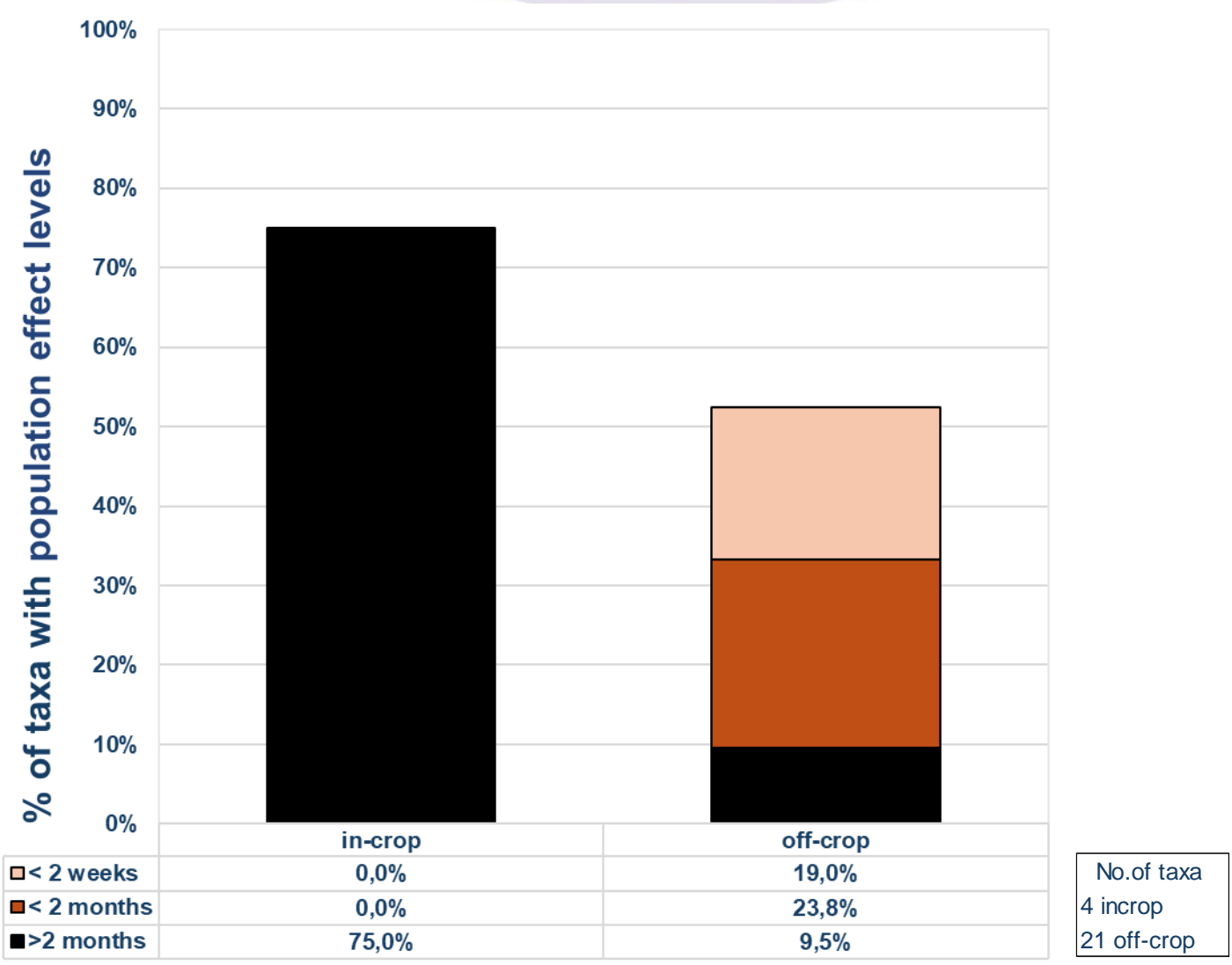


In our experiments, we see species belonging to certain families of spiders (Araneae) and beetles (Coleoptera) responding differently to the treatment with plant protection products, which cannot be explained by the arthropods' physiology, only. The phenomenon could be caused by long term exposure of different types of pesticides or by the differences in structure, abundance, and diversity of arthropod communities from different habitats.

Here, we investigate if the differences observed in the effect of the application of PPP on closely related taxa is correlated with habitat structure (off-crop vs in-field).

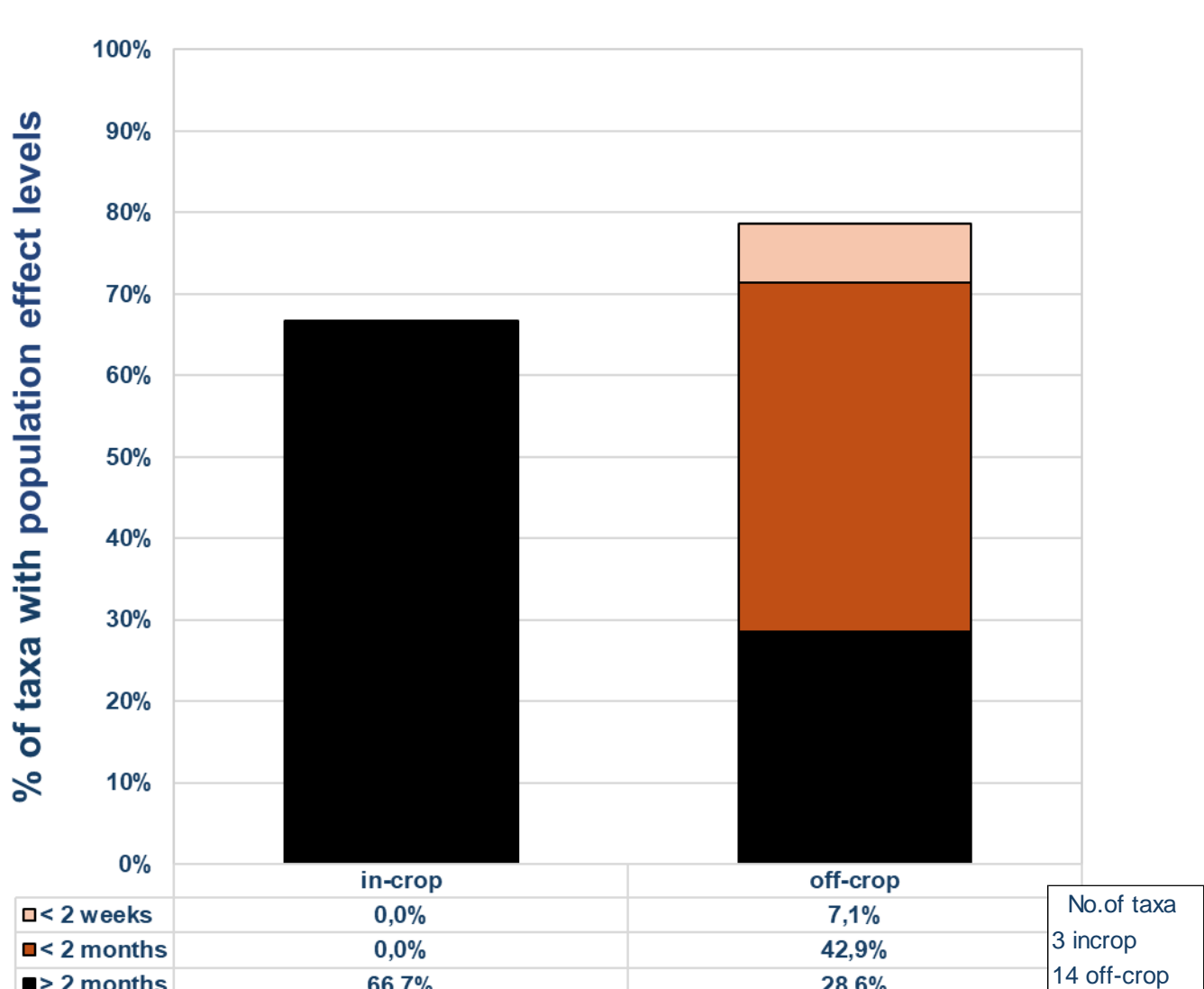
Beetles: Effect classes and recovery time in different habitat types

Aleocharinae: small beetles, predatory, highly mobile



- More affected taxa in-field vs. off-crop
- More taxa severely affected (> 2 months) in-crop vs. off-crop

Bembidiinae: small beetles with small home ranges



- More affected taxa off-crop vs. in-field
- More taxa severely affected (> 2 months) in-crop vs. off-crop

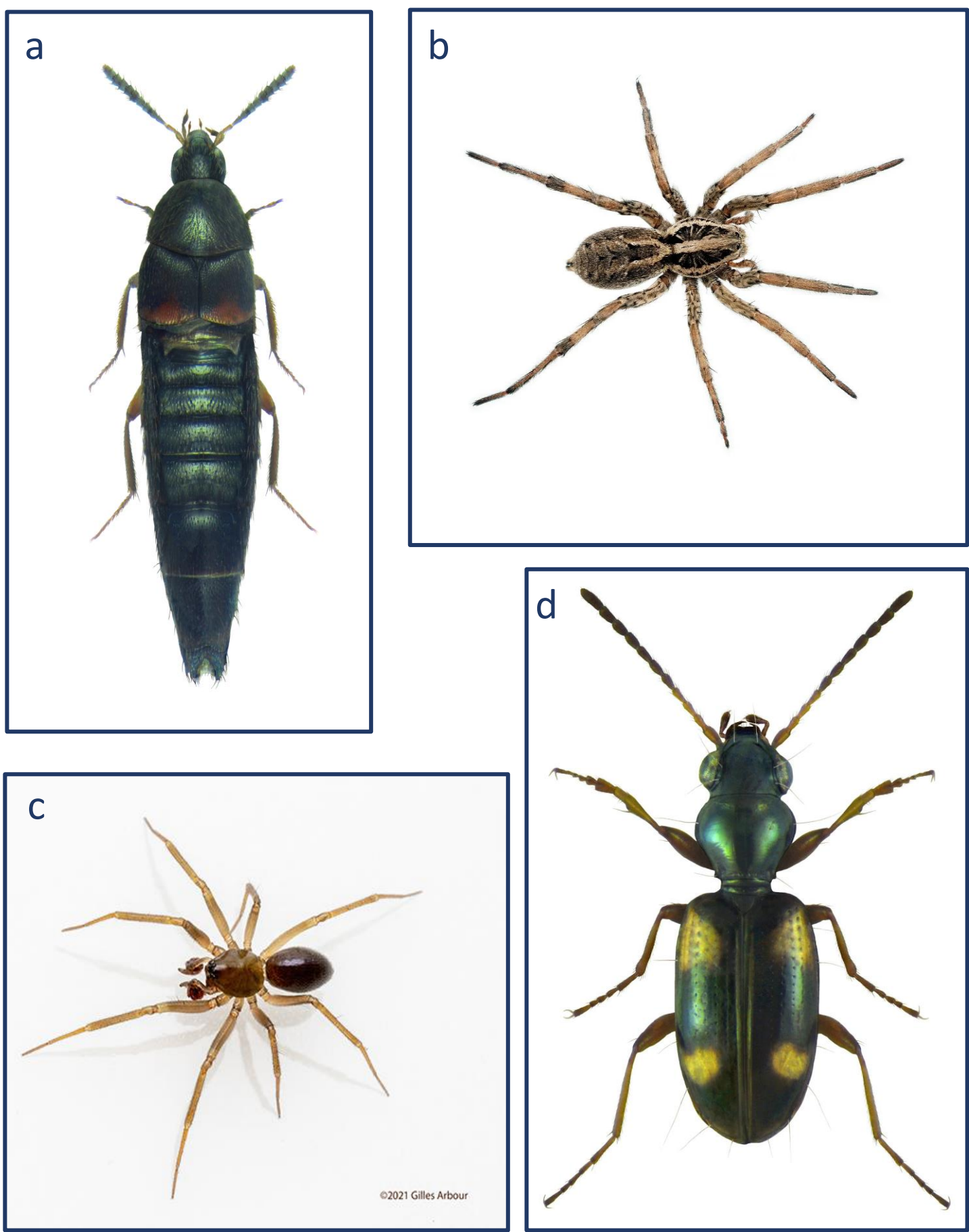
➡ The expected resistance of the local (in-crop) populations, due to prolonged exposure to PPP, is not evident from our data set. Thus, the size of the local populations together with structural elements of the habitat (e.g. vegetation cover) and ecological factors (e.g. preferred area for larval development, competition) are forming a complex matrix that seem to influence the response of the NTA to PPP.

Methods:

- NTA in-crop and off-crop studies from Central and Southern Zone (Netherlands, South-west France)
- 4 control replicates 4 treatment replicates (broad insecticide)
- Aspirator and pitfall sampling techniques
- Taxa included if sufficient data from at least 9 studies available.
- Data analysis: Abbott effect values, Mann-Whitney-U tests, Minimum significant difference (MSD van der Hoeven 2008), population effect levels following DeJong (2010)

Populations effect levels:

- Adverse effects no longer apparent within 2 weeks
- Adverse effects no longer apparent within 8 weeks
- No recovery from adverse effects within 2 months



a) Aleocharinae, b) Lycosidae, c) Linyphiidae, d) Bembidiinae

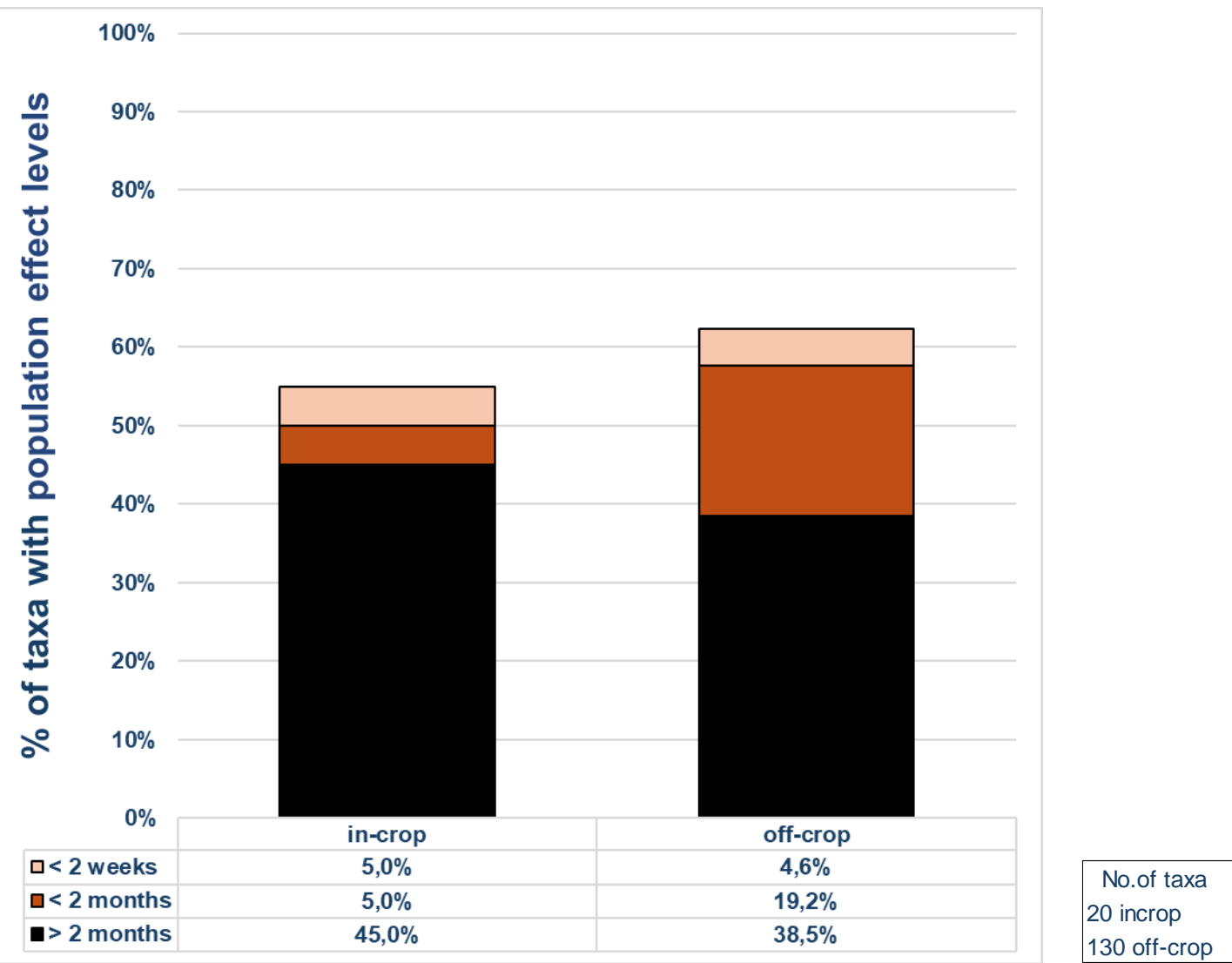
Acknowledgements:

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References: Bakker F., Dehelean S.B., 2015, Do ground beetles differ in their response to chlorpyrifos?, SETAC Barcelona, poster presentation

Spiders: Effect classes and recovery time in different habitat types

Linyphiidae: small spiders, large home range (ballooning)

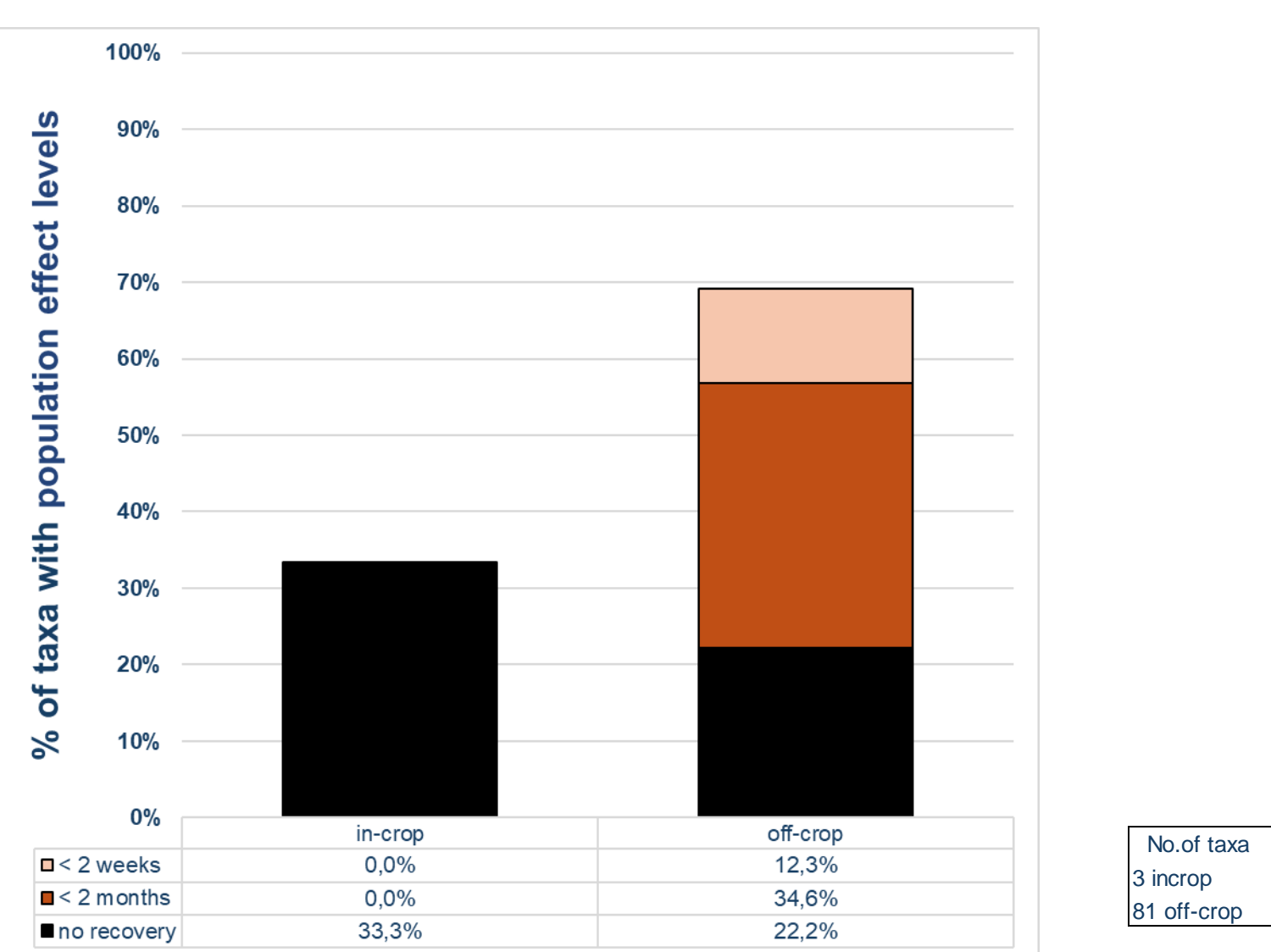


- Proportion of total affected taxa similar between the habitats.
- Proportion of severely affected (> 2 months) similar between the two habitats

These results show that:

- ❑ Larger species are not necessarily more resistant to the effects of PPP (see also Bakker and Dehelean 2016)
- ❑ The dispersion strategies of species within a habitat and between habitats influences the recovery potential and must be understood per species and per habitat.

Lycosidae: medium sized spiders with small home ranges



- More affected taxa off-crop vs. in-field
- More taxa severely affected (> 2 months) in-field vs. off-crop