Crop diversity in the landscape favors bats and biological control of some pests

Axelle Tortosa, Brice Giffard, Luc L. Barbaro, Jérémy Froidevaux, Sylvie Ladet, Jeanne Delhommel, A. Vialatte

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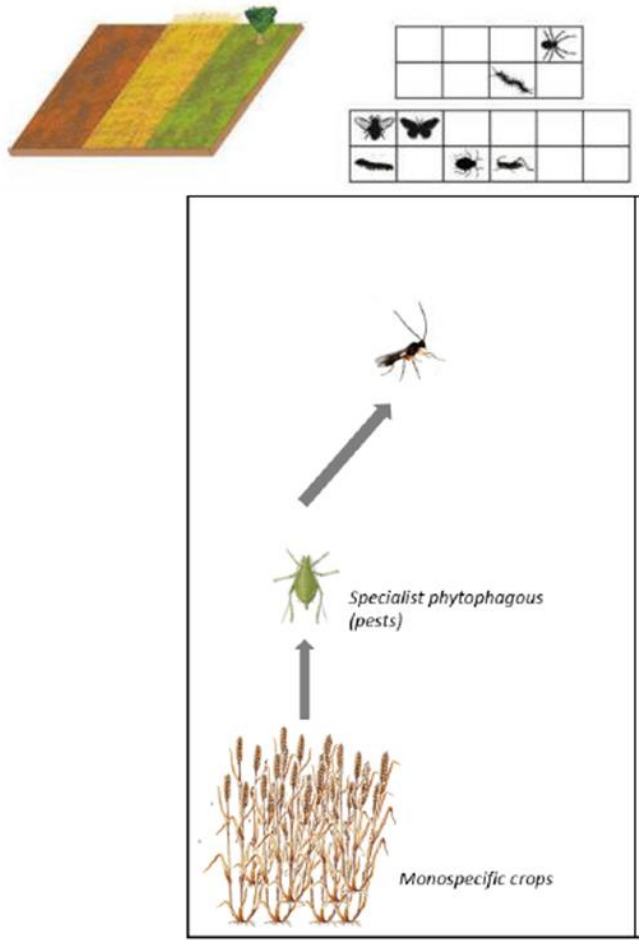
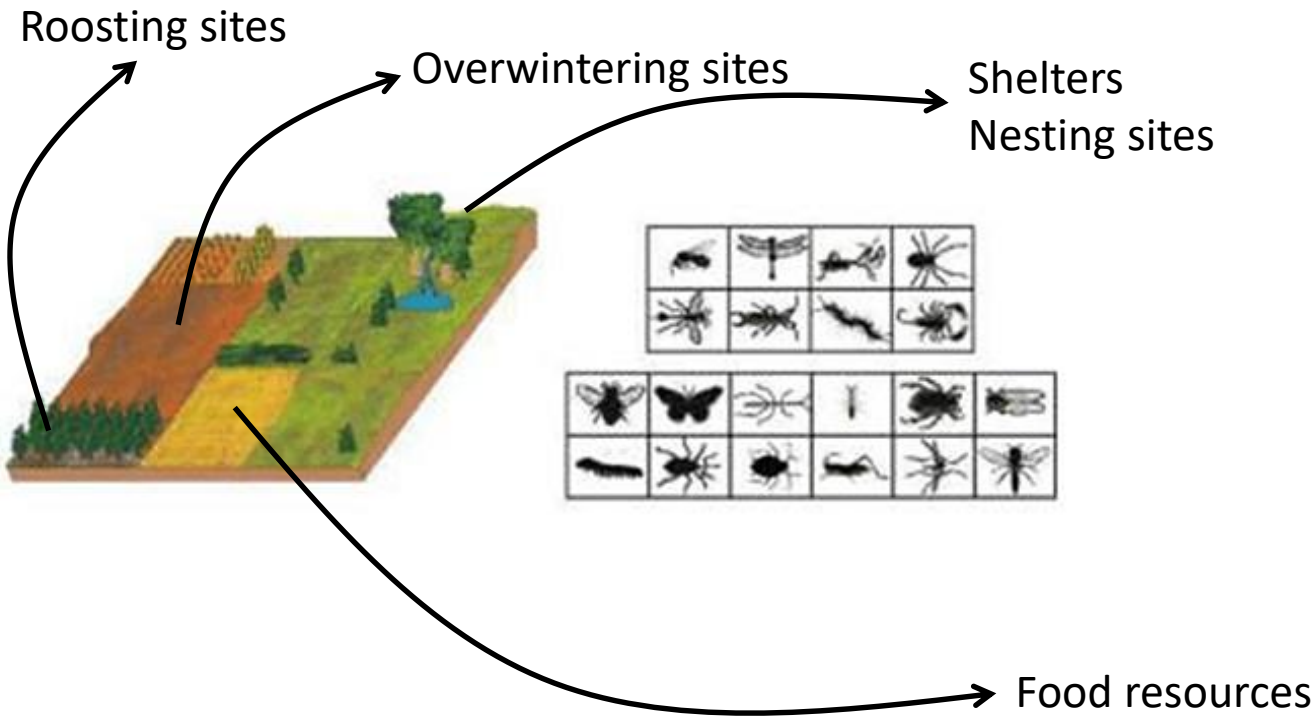
Crop diversity favors natural enemies' diversity and biological pest control





(Damien, 2018; Hutchinson, 1959; Nesme et *al.* 2016, Root, 1973)

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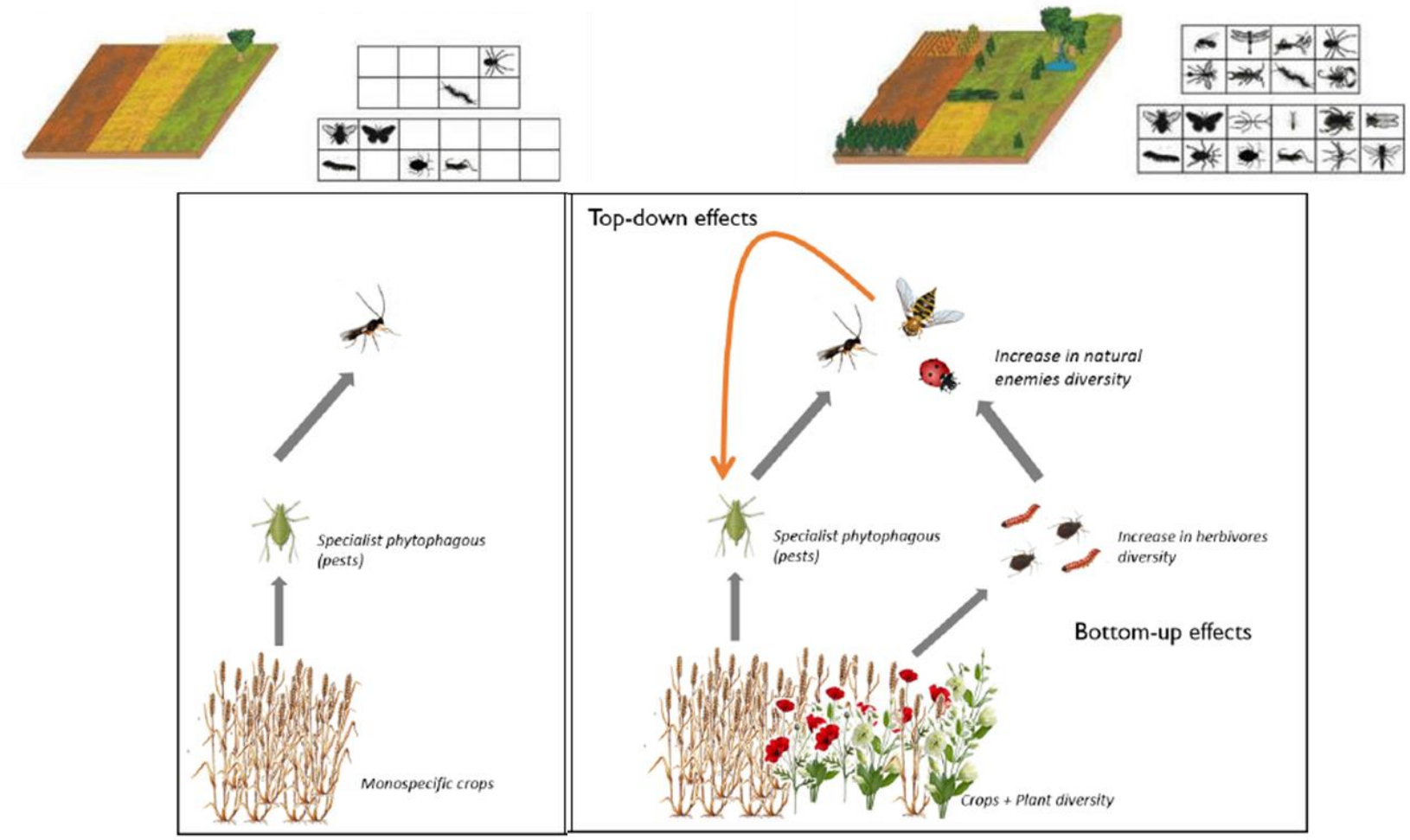
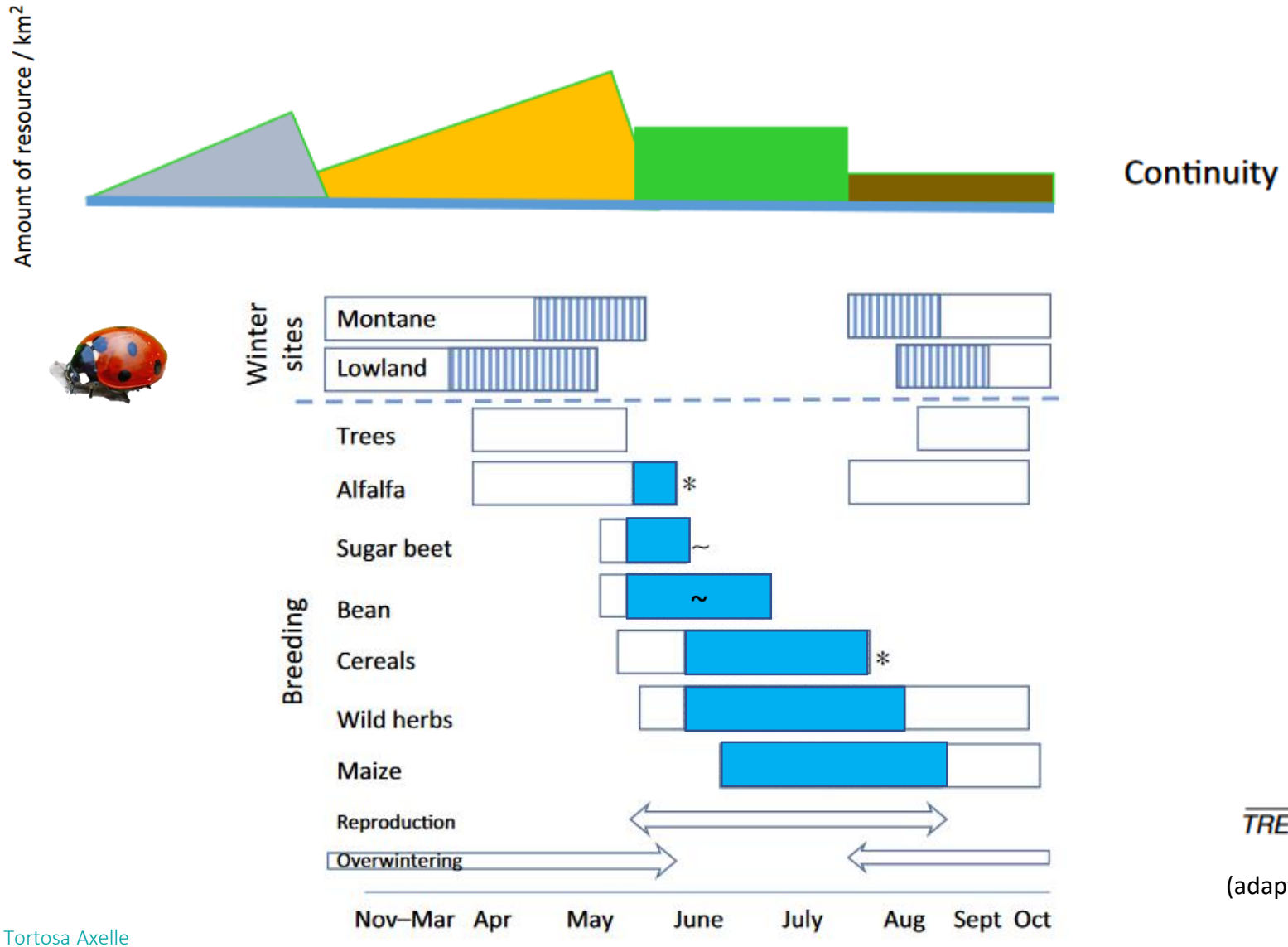


(Damien, 2018; Hutchinson, 1959; Nesme et *al.* 2016, Root, 1973)

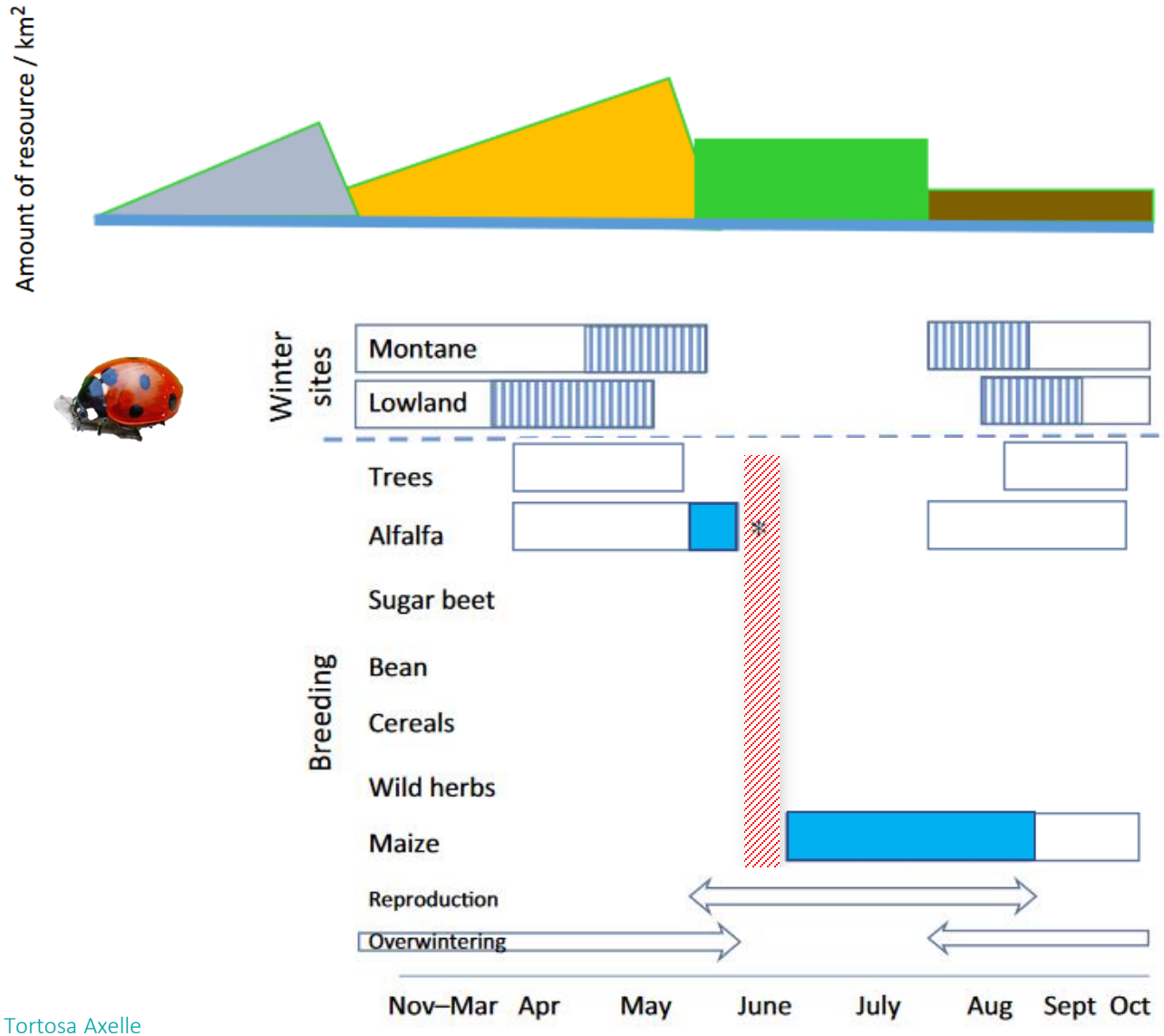
Resources continuity within agricultural landscapes



TRENDS in Ecology & Evolution

(adapted from Schellhorn et al., 2015)

Resources continuity within agricultural landscapes

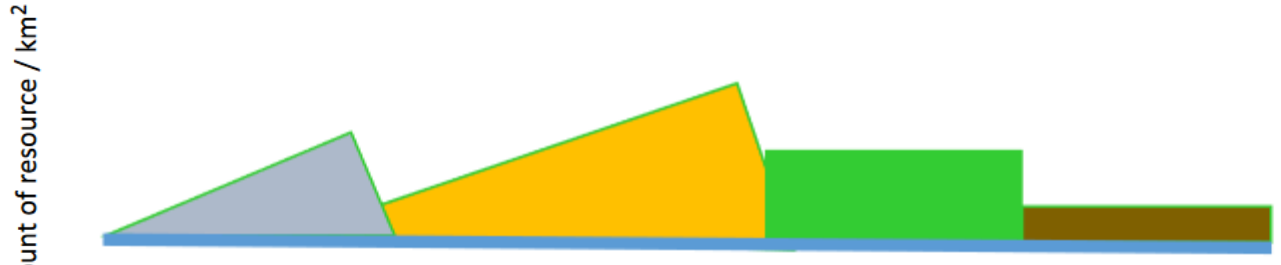


Agricultural landscape dominated by maize and alfalfa

TRENDS in Ecology & Evolution

(adapted from Schellhorn et al., 2015)

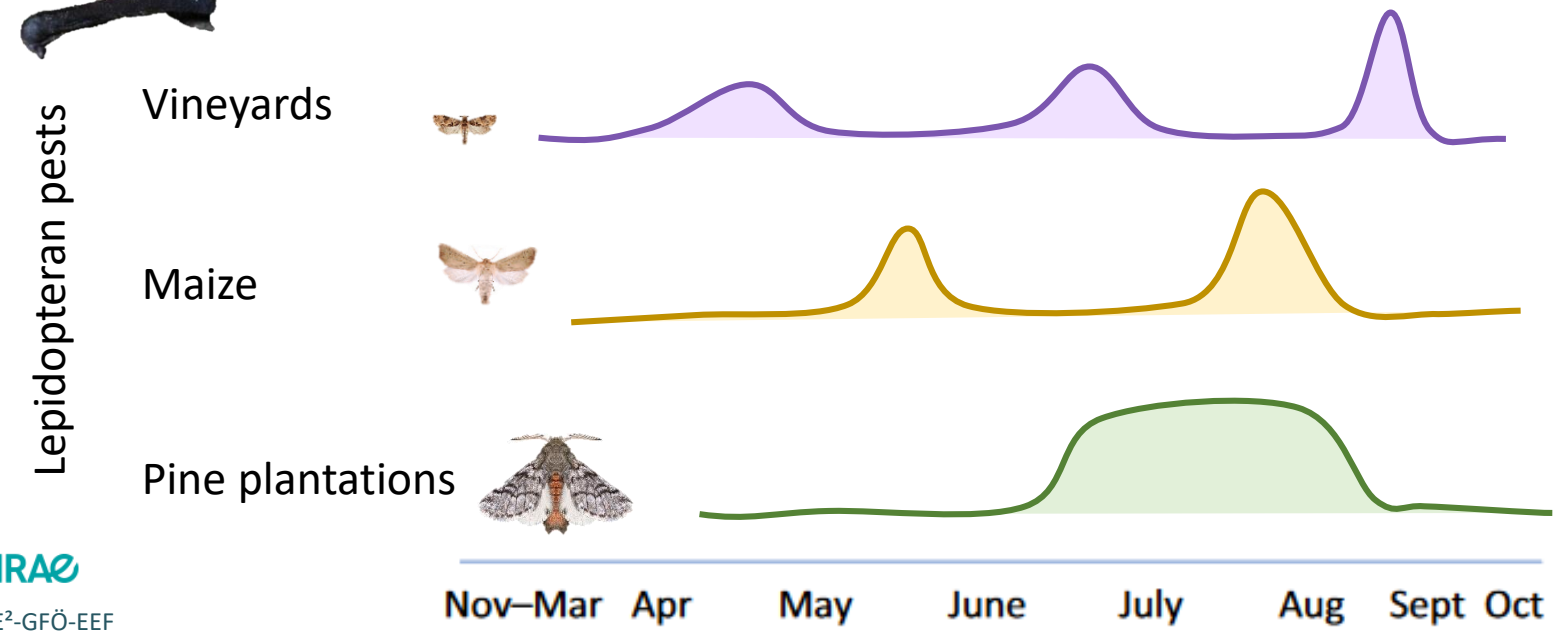
Resources continuity within agricultural landscapes



Continuity

TRENDS in Ecology & Evolution

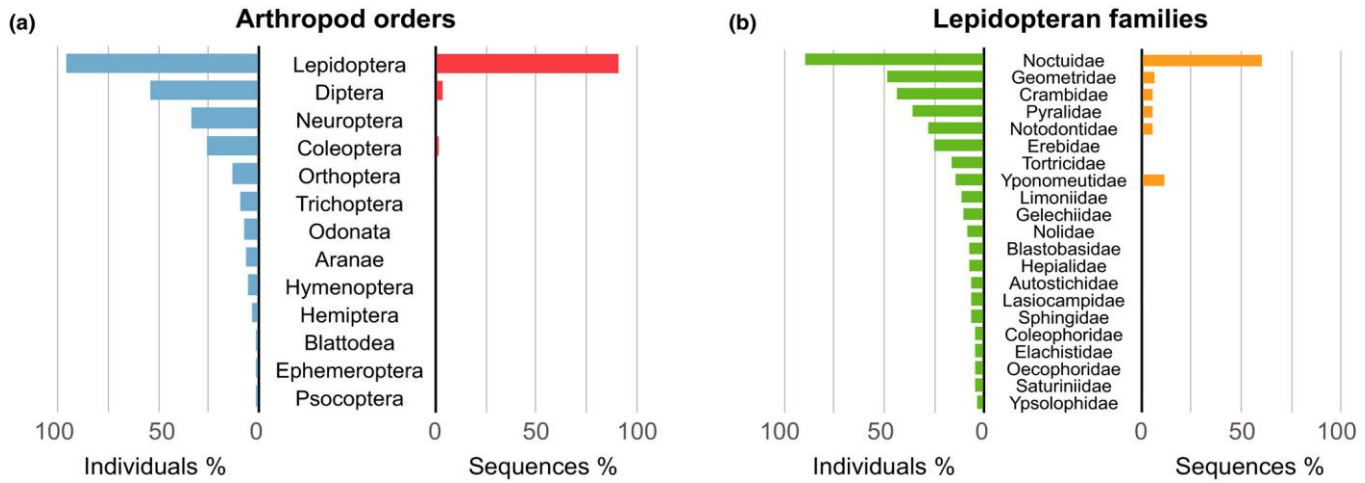
(adapted from Schellhorn et al., 2015)



Agricultural landscape with **vineyards**, **maize fields** and **pine plantations**

(Aizpurua et al., 2018; Charbonnier et *al.*, 2014; Charbonnier et *al.* 2021; Garin et *al.* 2019)

Bats as generalist predators of agricultural and forest pests



(Aizpurua et al., 2018)

➡ Lepidopteran pests are valuable food resources for bats

(Mata et al, 2021; Tournayre et al., 2020)

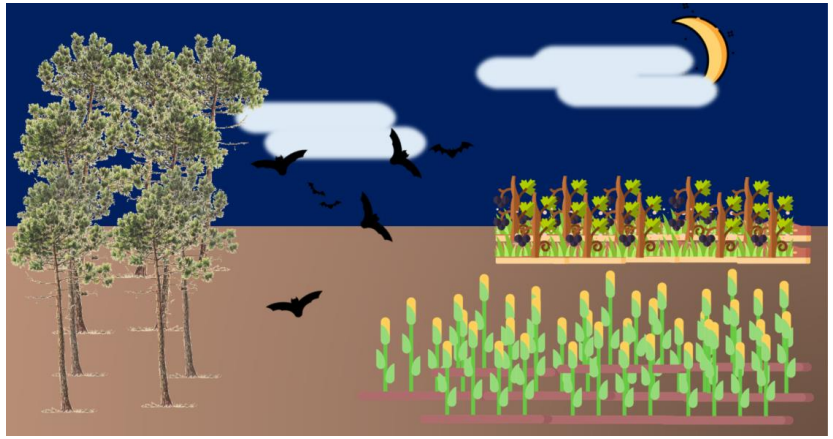
➡ Bats may be considered as bioindicators through their activity

(Alleva et al., 2006; Jones et al., 2009; Stahlschmidt & Brühl, 2012; Russo et al., 2021)

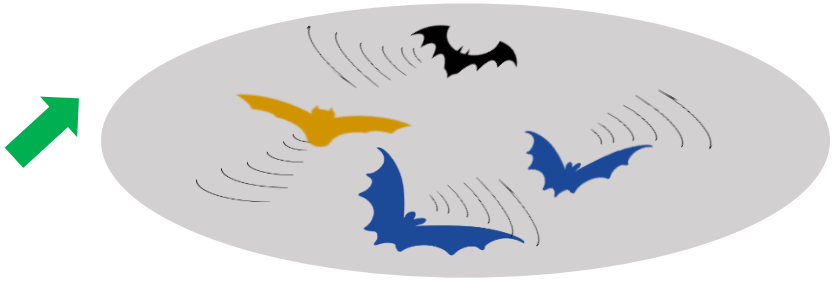
› Is the mixture of these **three crops** at the landscape scale **favorable to bats** and does it **favor biological control of pests** ?

Is the mixture of these three crops at the landscape scale favorable to bats and does it favor biological control of pests ?

VS



- Higher **species richness** and **activity**



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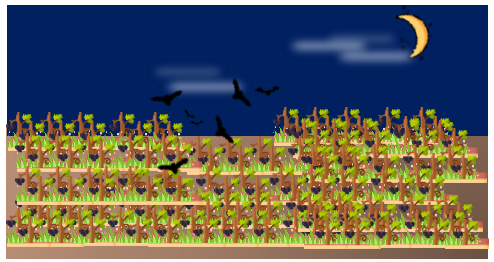

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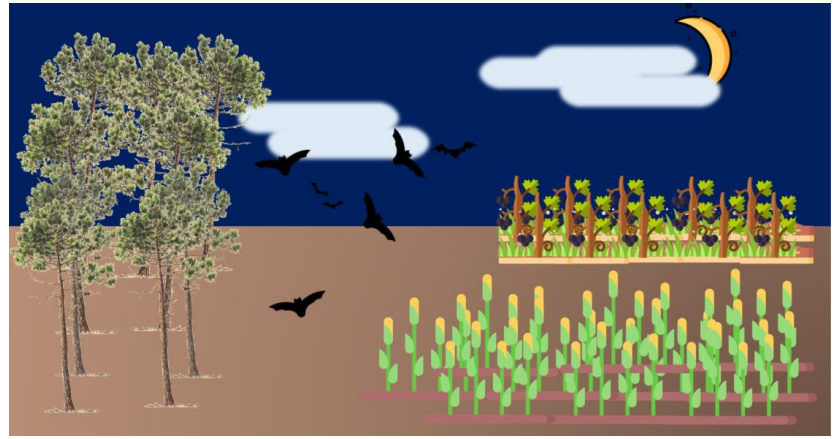
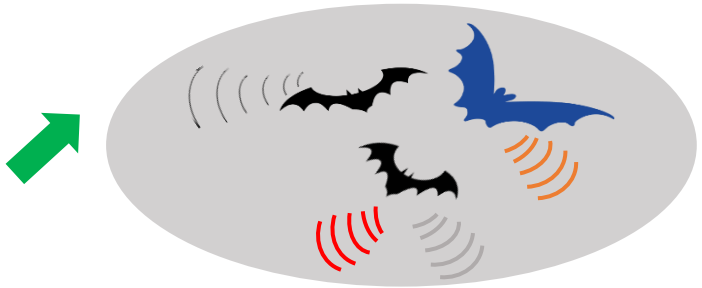
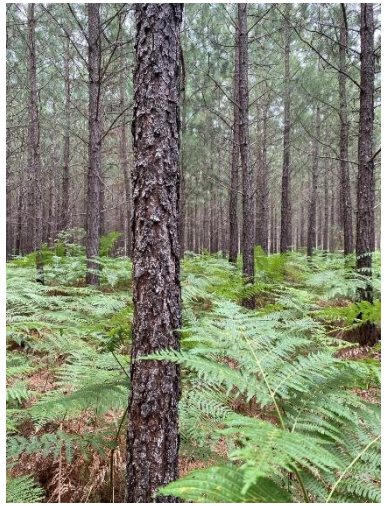


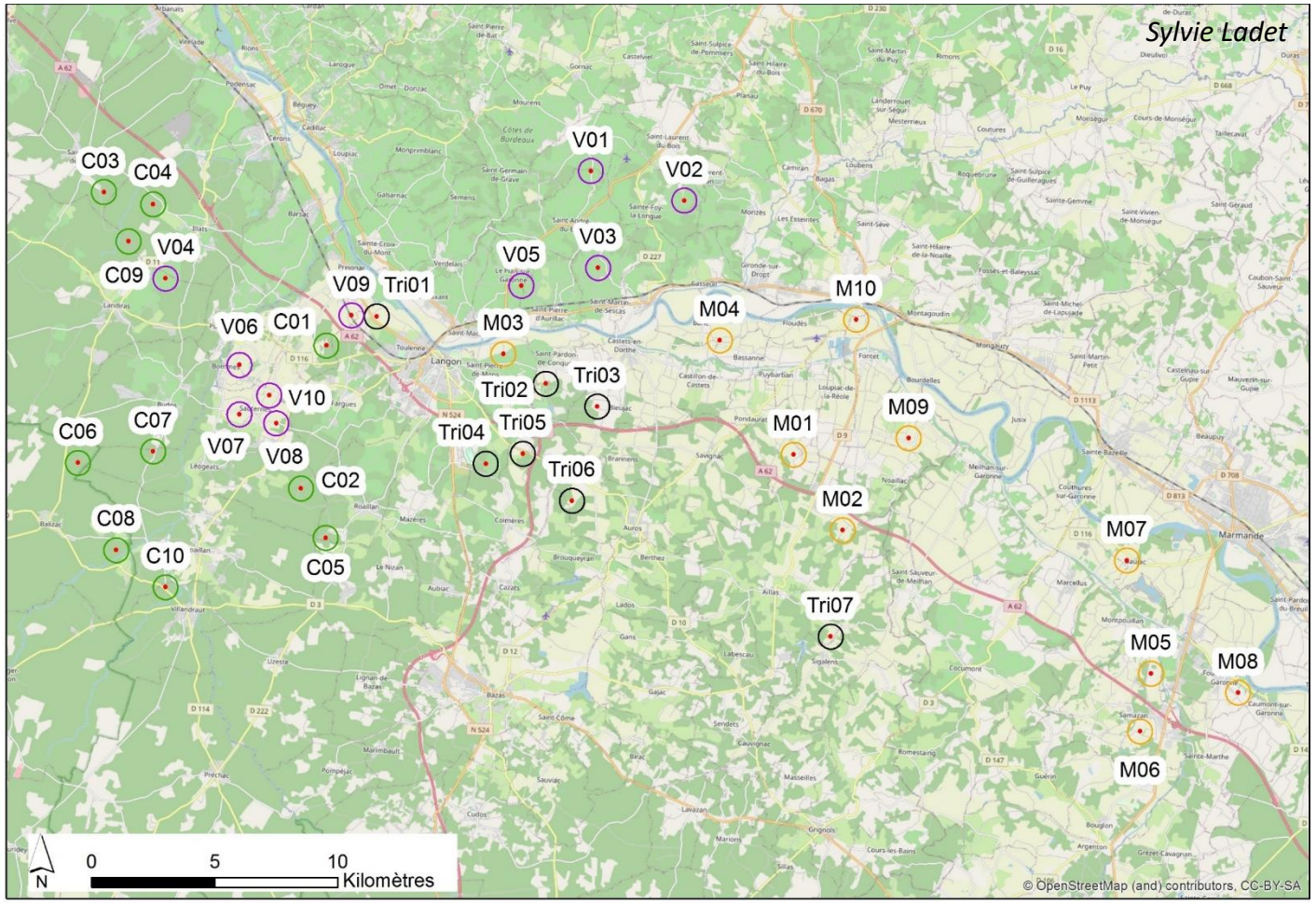
- Higher **foraging activity** and **less crop damage**



Material and methods

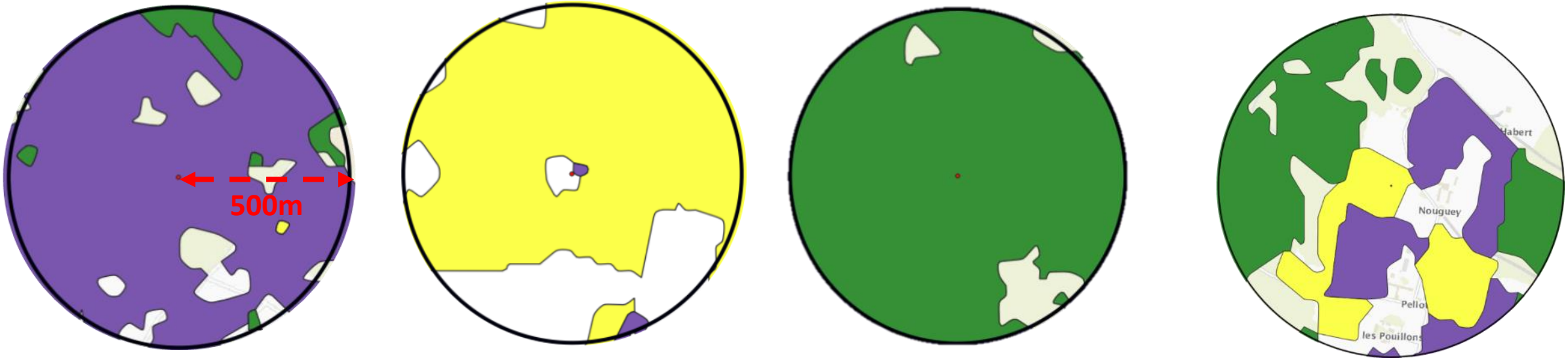


Données à valeur ajoutée traitées par le CNES pour le pôle de données Theia www.theia.land.fr à partir de données Copernicus. Les traitements utilisent les algorithmes développés par les Centres d'Expertise Scientifique de Theia.



Material and methods

X 10 | X 10 | X 10 | X 7



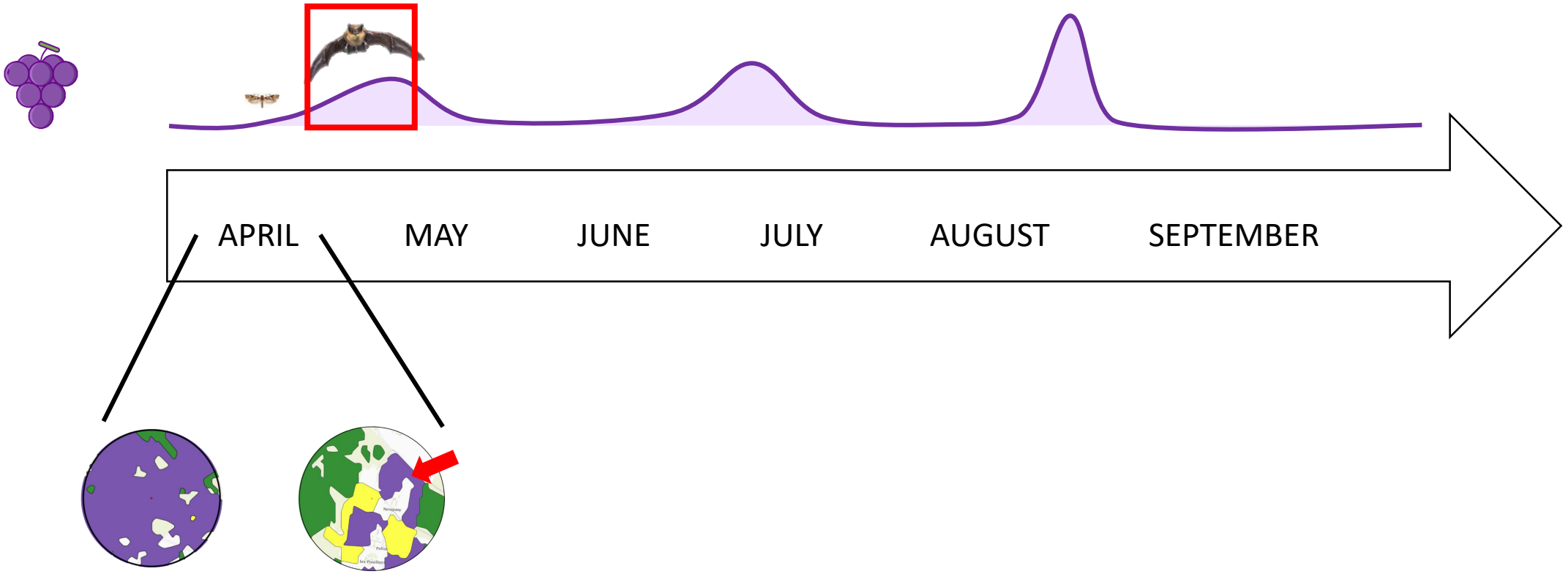
Crop-dominated landscapes

N = 3 x10

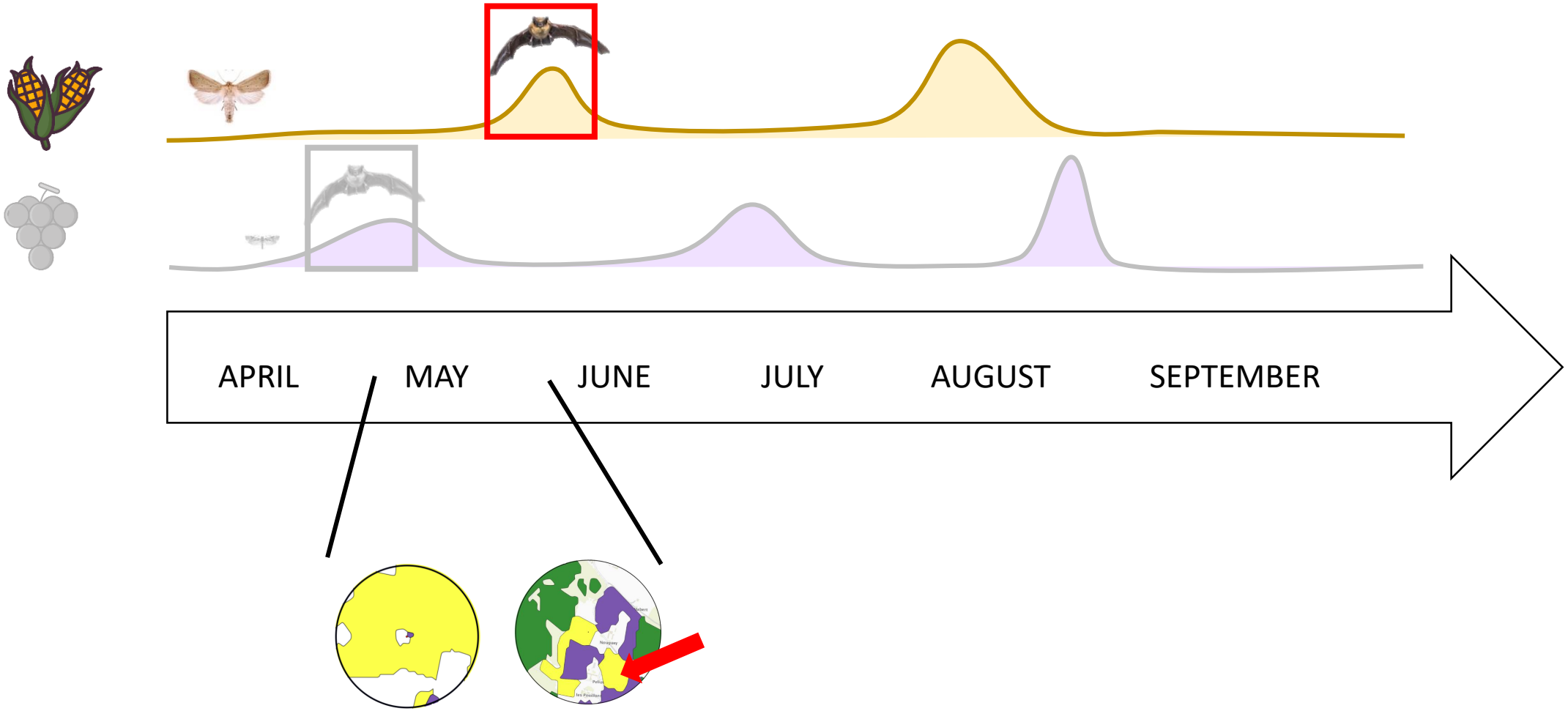
Diverse landscapes

N = 7

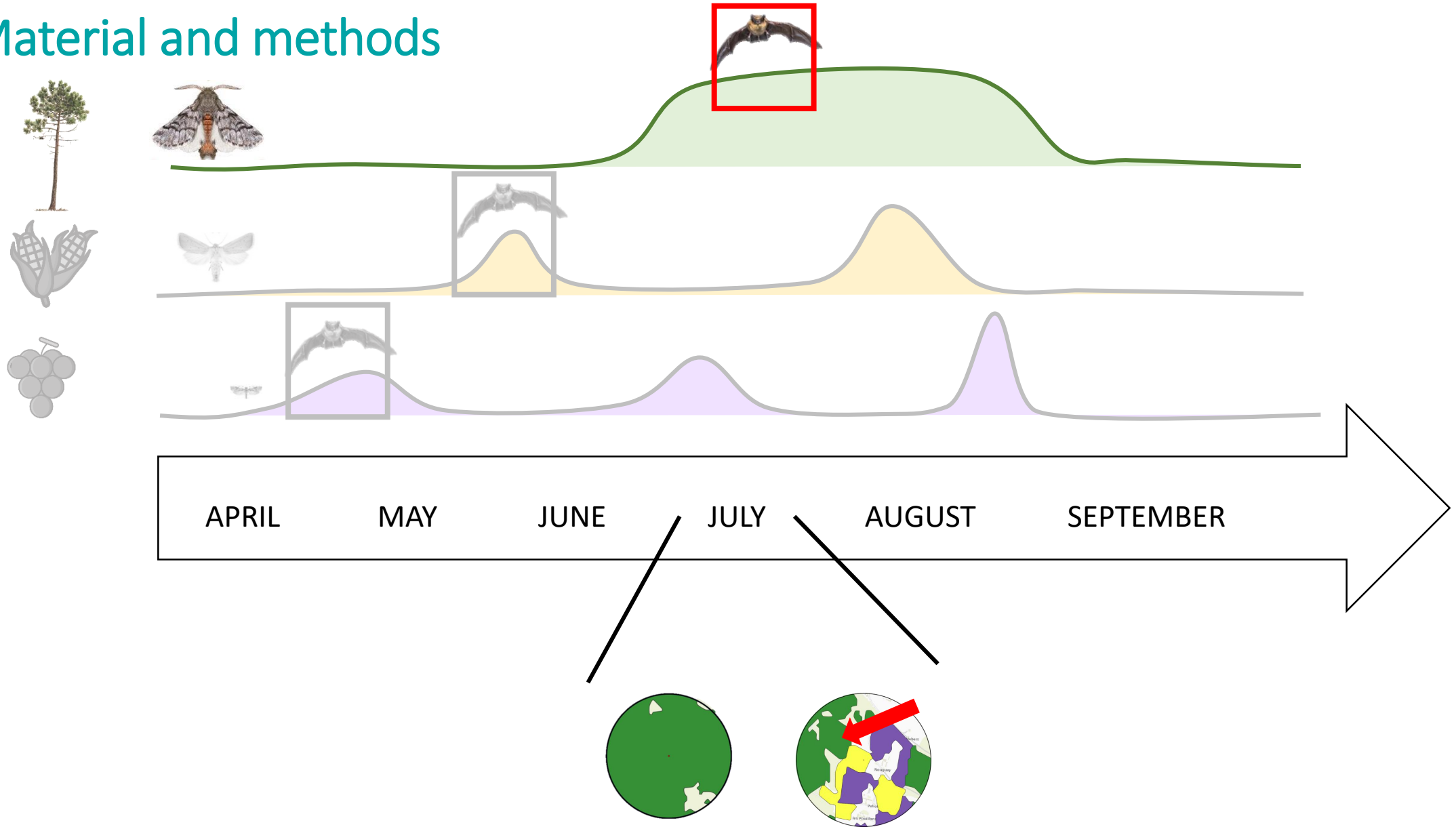
Material and methods



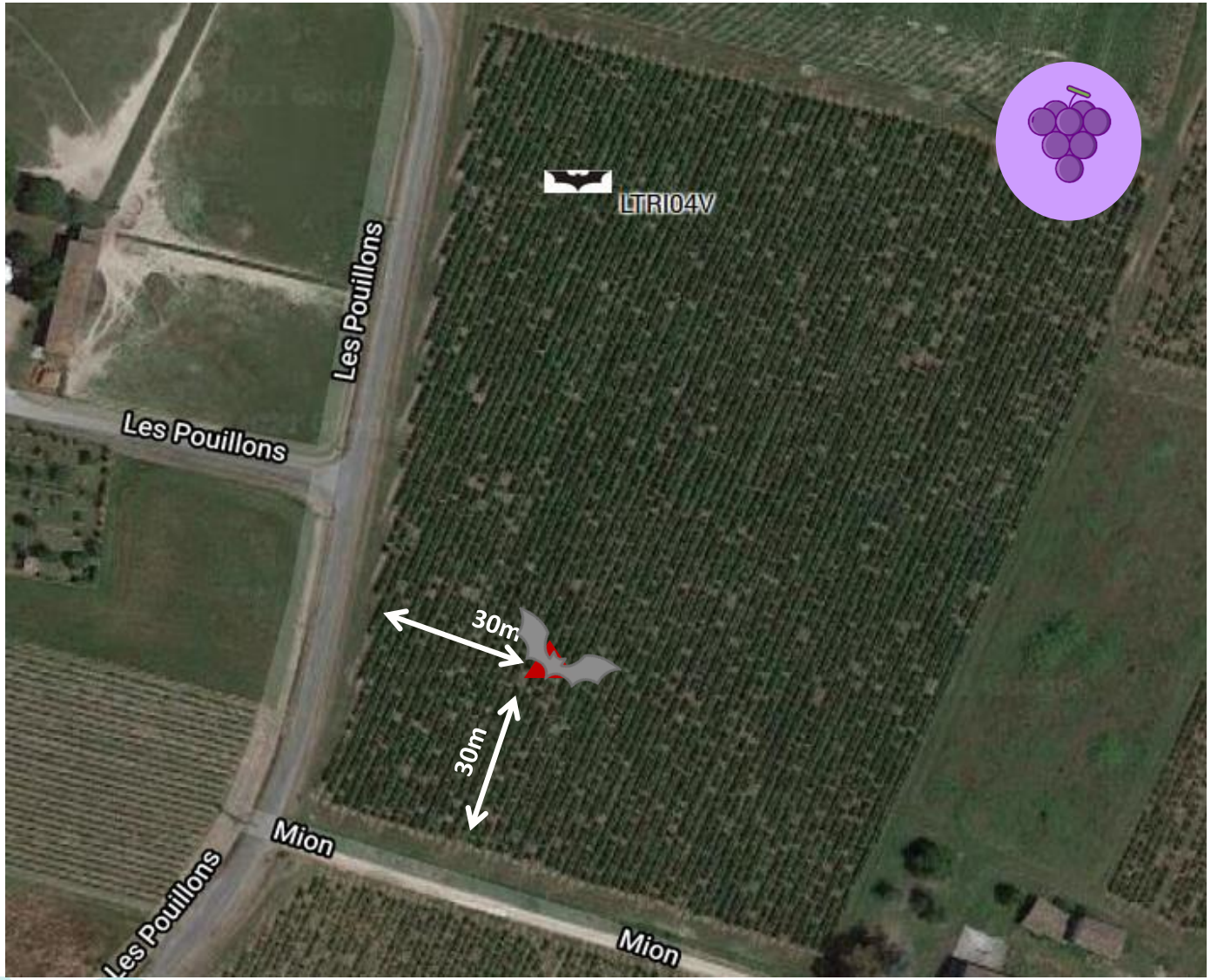
Material and methods

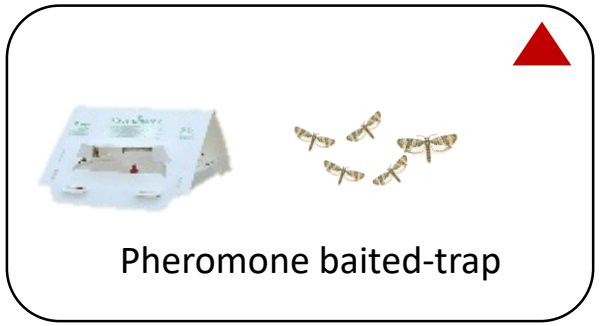


Material and methods

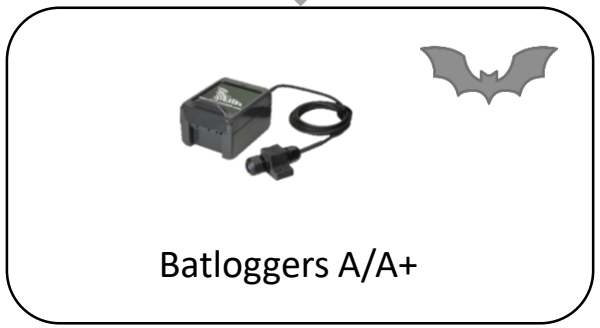


Material and methods





+ 7 nights



+ 2 nights

TADARIDA

(https://github.com/YvesBas/Tadarida-C/; Bas et al., 2017)

Material and methods

Damage

Results

Is the mixture of the three crops favorable to bats?

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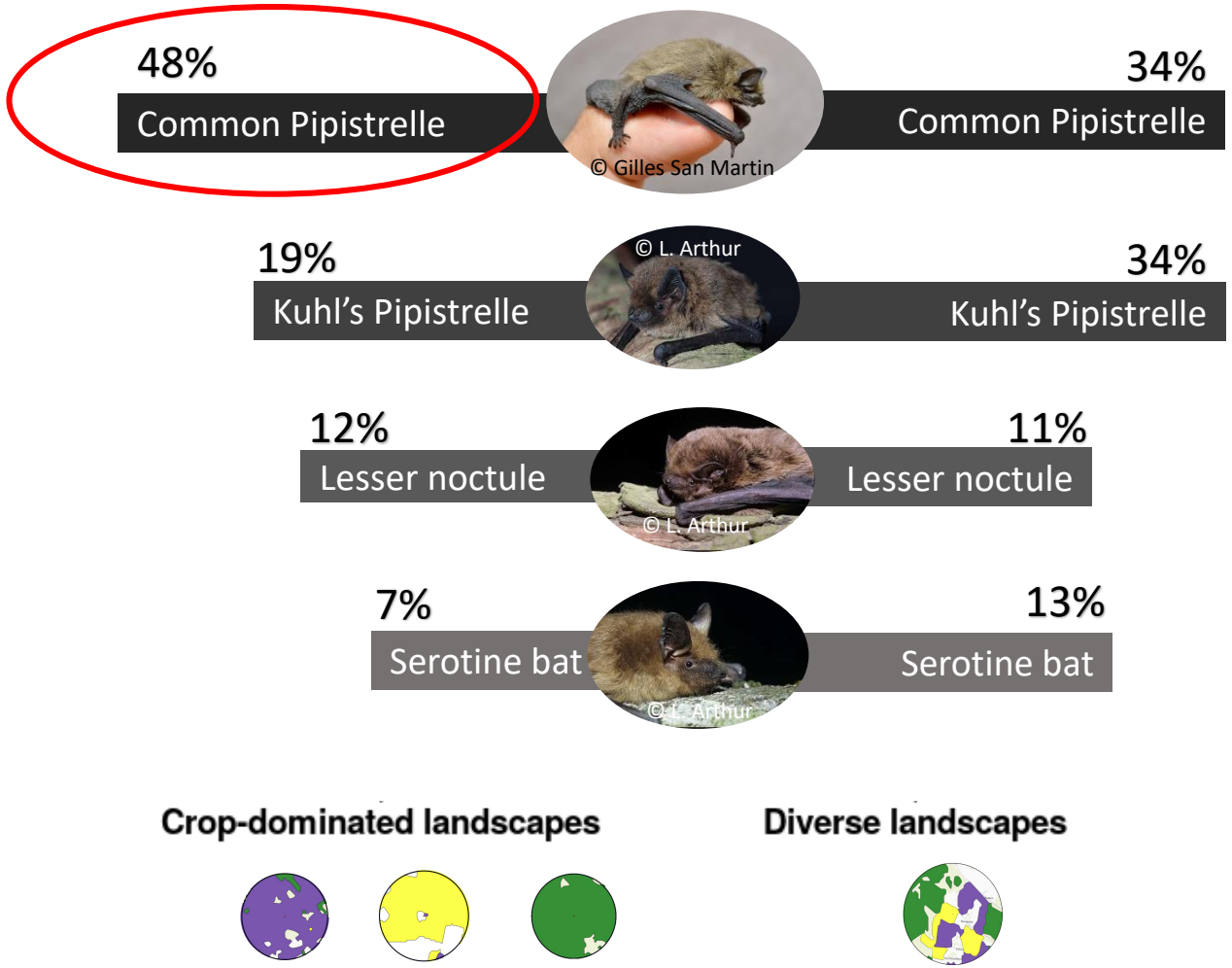
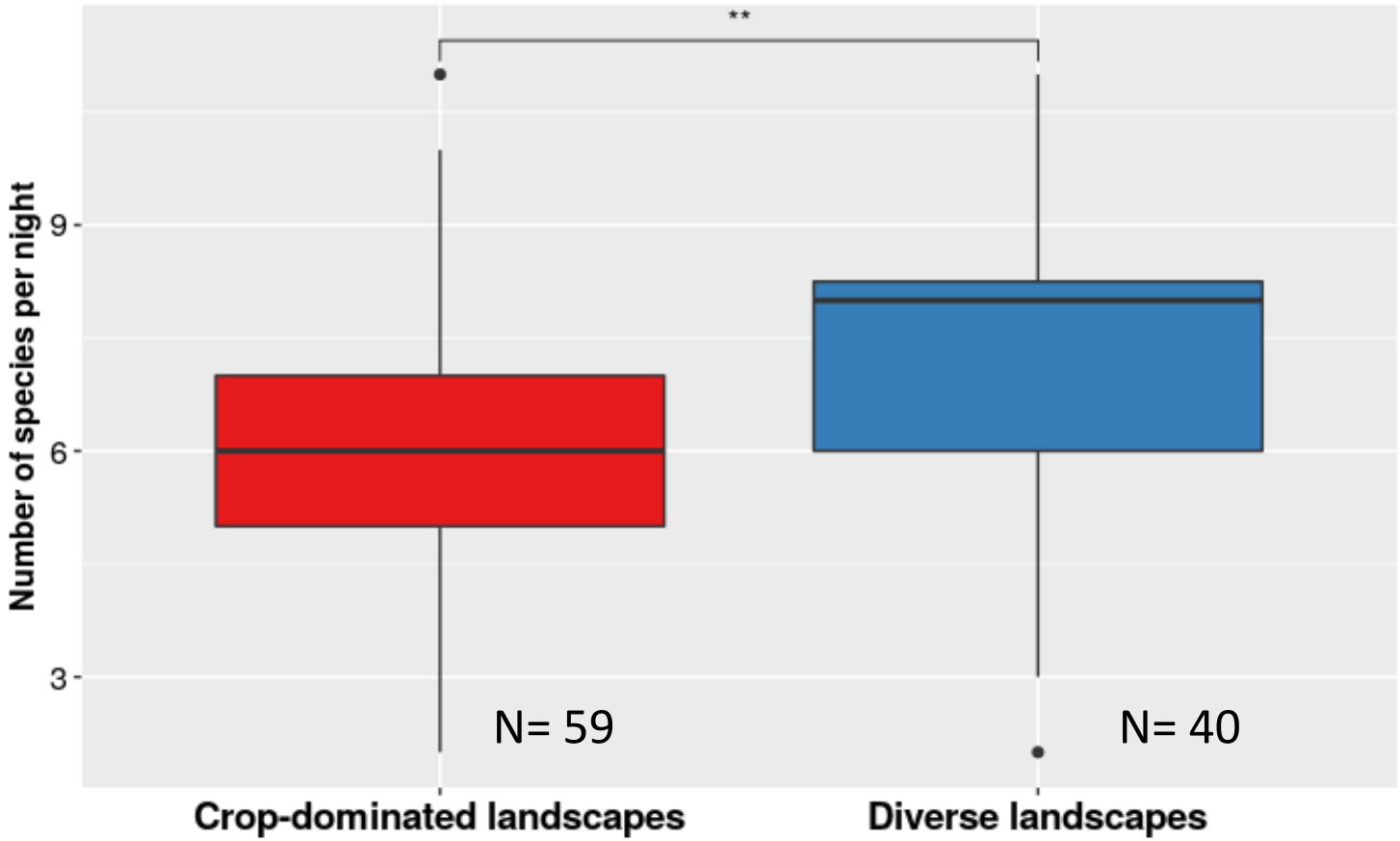


Results

Is the mixture of the three crops favorable to bats ?

Higher **species richness**



Results

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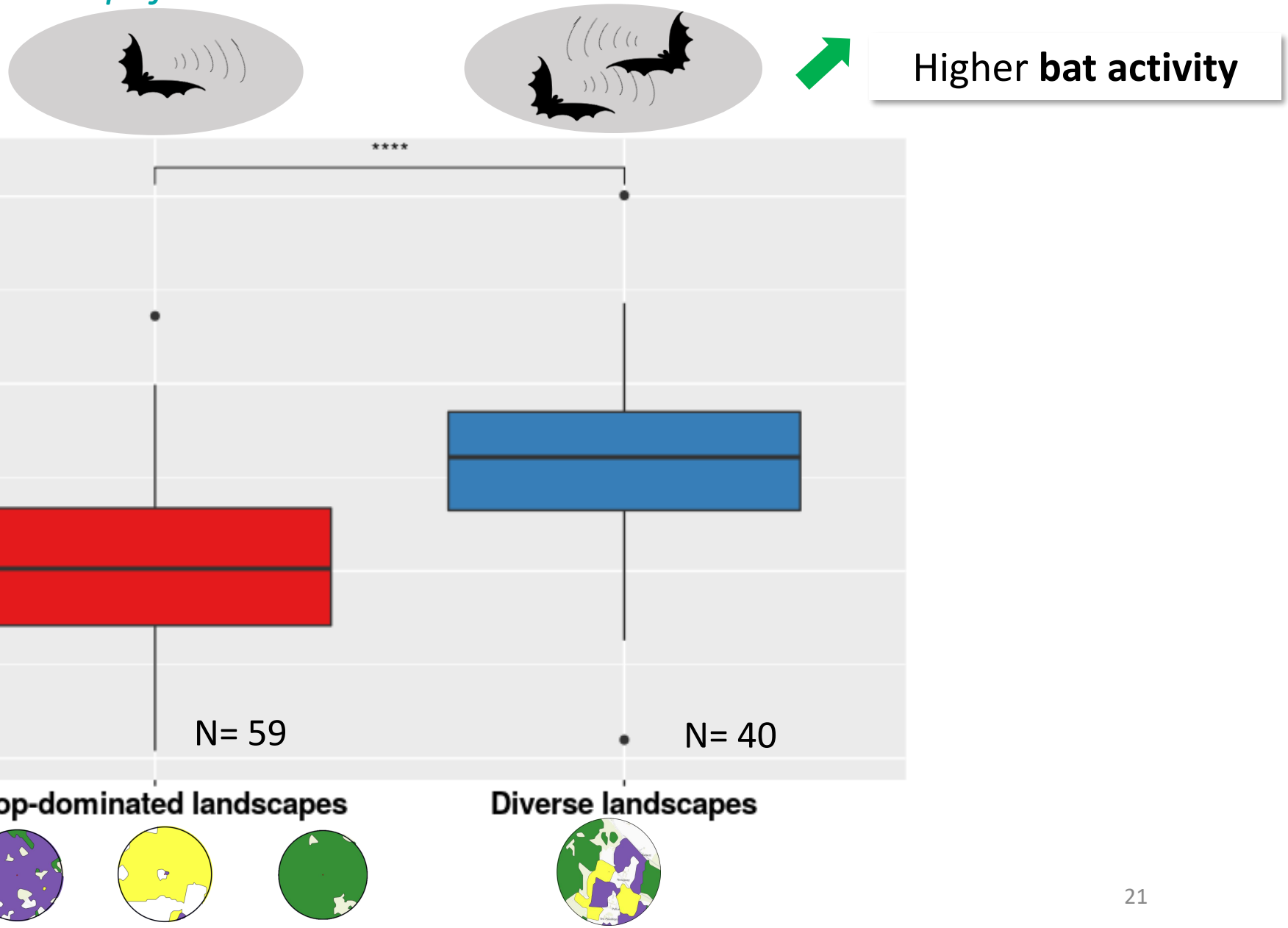

Results

What are the implications for biological control of lepidoteran pests ?

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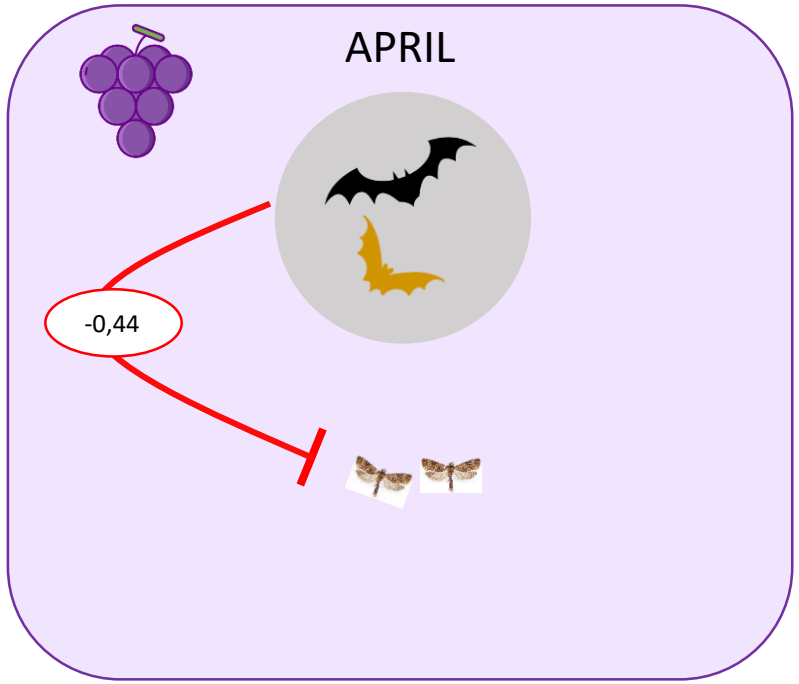
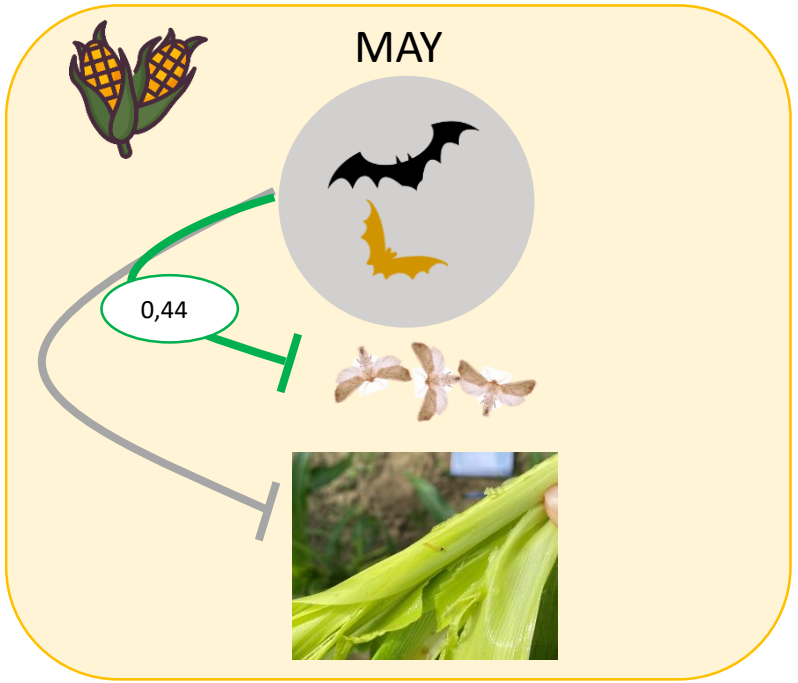
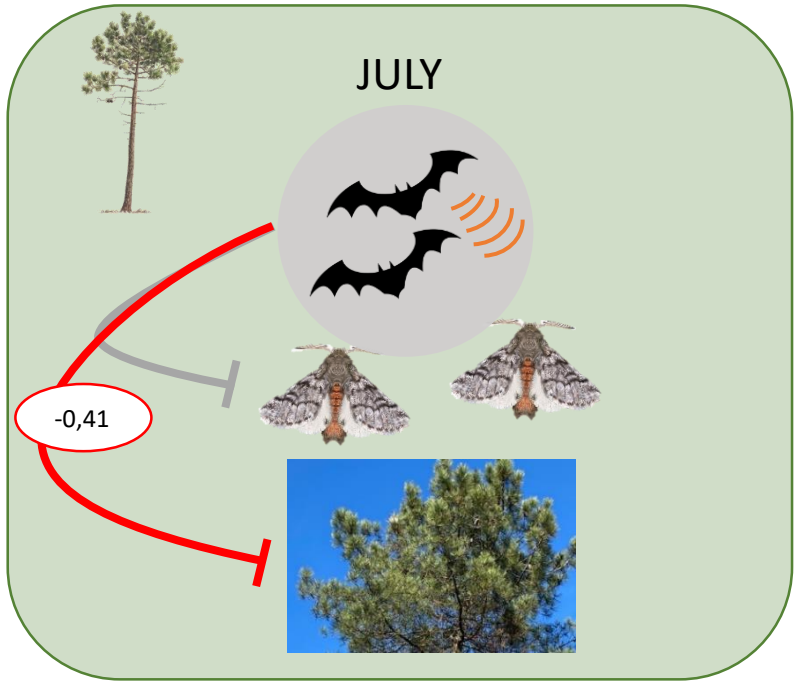


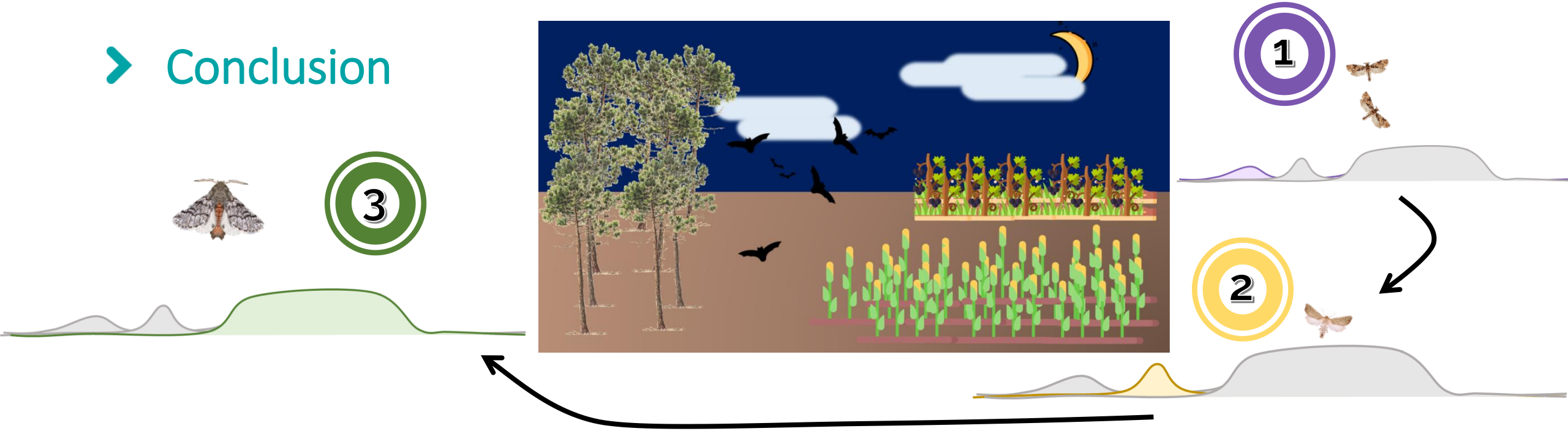




- Indicator of potential biological control
- The abundance of moths seems to attract bats, the associated predator-prey dynamics do not allow for biological control
- Bats were efficient biological pest control agent for the pine processionary moth

(Charbonnier et *al.*, 2014, 2021; Maine & Boyles, 2015)

Conclusion



	Biodiversity	Biological pest control
	WIN	Neutral
	WIN	Neutral
	WIN	WIN



Thank you for your attention !