



Contribution of annual crops vs. semi-natural habitats to landscape connectivity for different types of carabid beetle communities

Stéphanie Aviron, Sylvain Poggi, Nicolas Parisey, Remi Duflot, Hugues Boussard, Etienne Lalechère

► To cite this version:

Stéphanie Aviron, Sylvain Poggi, Nicolas Parisey, Remi Duflot, Hugues Boussard, et al.. Contribution of annual crops vs. semi-natural habitats to landscape connectivity for different types of carabid beetle communities. IALE World congress 2015., Jul 2015, Portland, United States. 11 p. hal-01458650

HAL Id: hal-01458650

<https://hal.science/hal-01458650>

Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Observatoire
des Sciences de l'Univers
de Rennes



Contribution of annual crops vs. semi-natural habitats to landscape connectivity for different types of carabid beetle communities

**Aviron S., Poggi S., Parisey N., Duflot R.,
Boussard H., Lalechere E.**

INRA SAD-Paysage, UMR IGEPP, UMR Ecobio CNRS –
Université Rennes 1, France

etienne.lalechere@irstea.fr

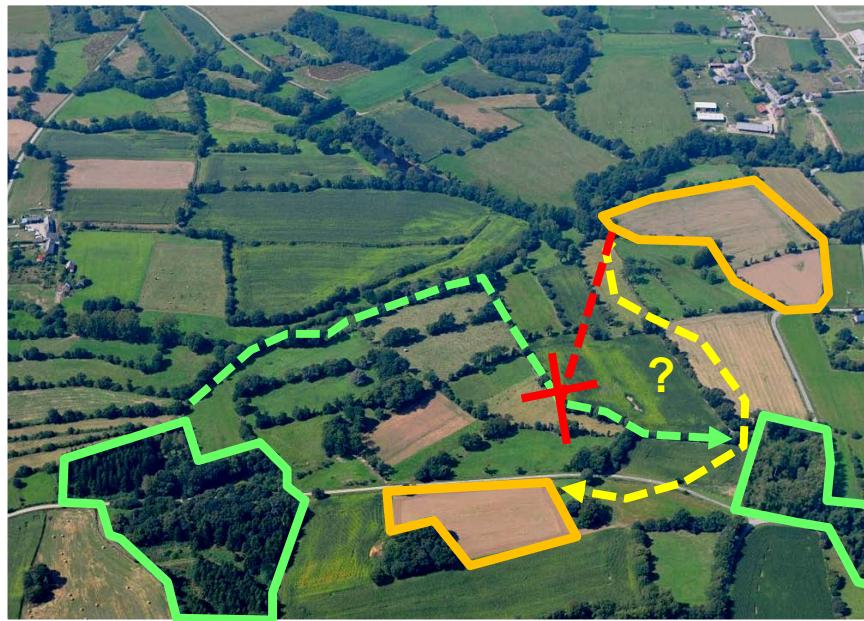
stephanie.aviron@rennes.inra.fr



Landscape connectivity in agricultural landscapes

- “The degree to which the landscape facilitates or impedes movements between resources patches”
(Taylor et al. 1993)

Forest species
Connectivity of
hedgerow and
woodlots



Crop species
*Barrier effect of
woody elements.
Crop connectivity ?*

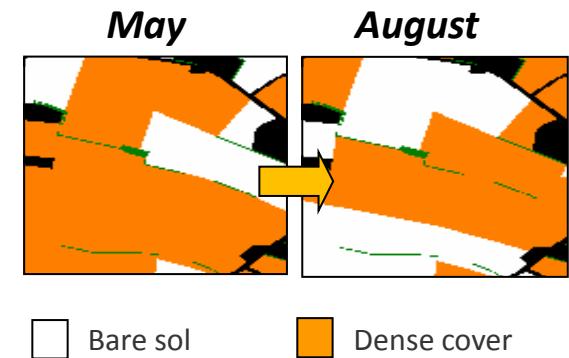
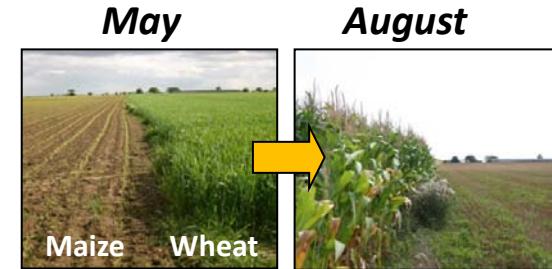


Spatio-temporal dynamics of resources in the cultivated mosaic



□ For crop species :

- **The availability of resources** depends on crop cover state and farming practices => **asynchronous** in crops sown and harvested at different times.
- It results in a **fast-changing distribution of resources** at the landscape scale

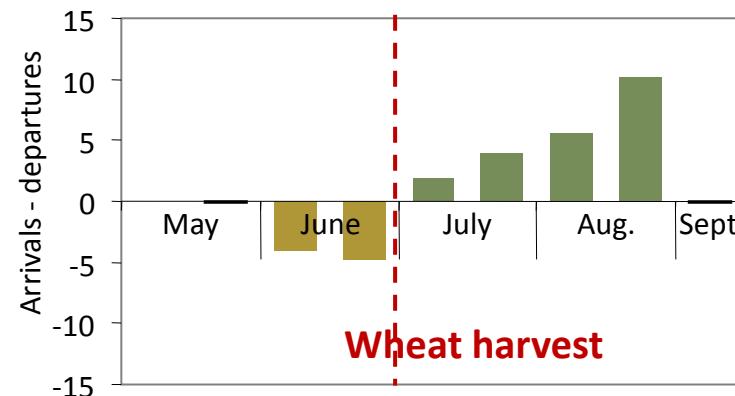
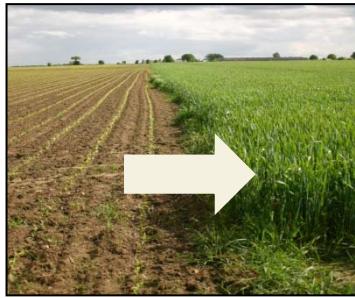


Effect of resource dynamics on insect movements



□ Orientation of carabid movements at edges between asynchronous crops (winter vs. spring crops) :

Movements toward winter cereals



Movements toward spring maize

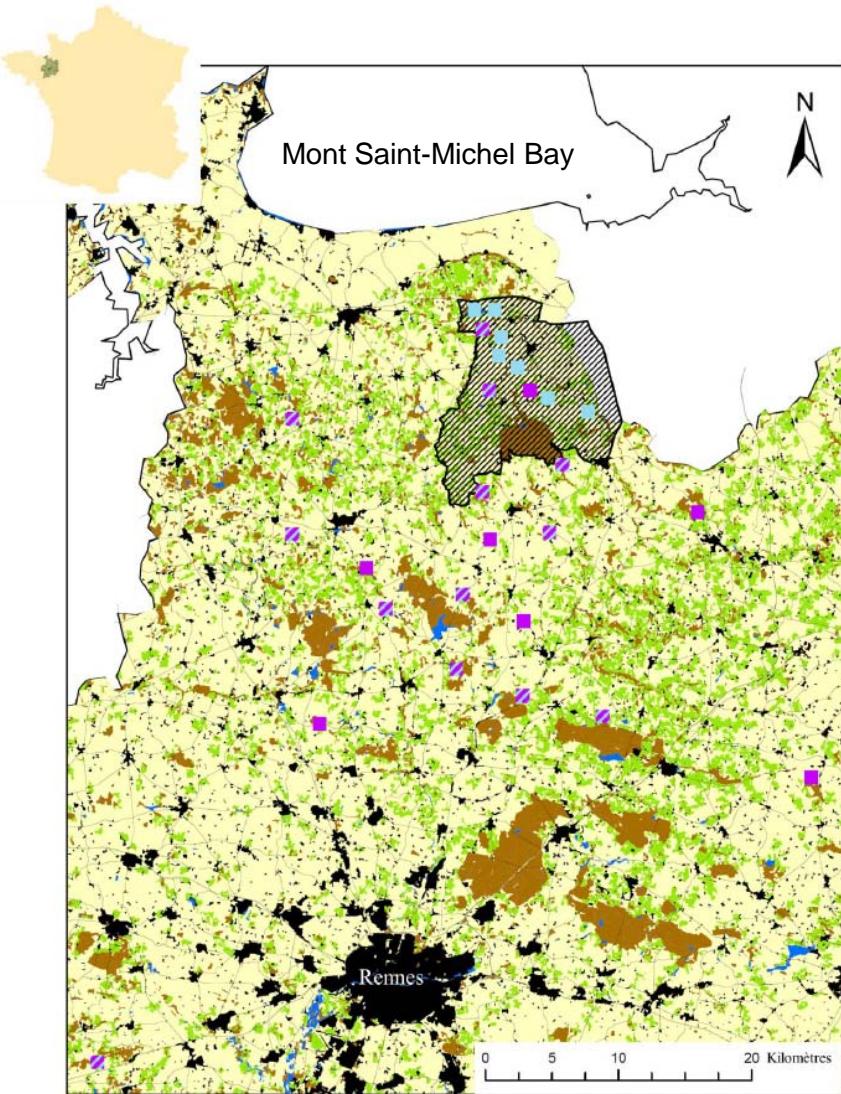


- Complementation processes between asynchronous crops
- Effect of connectivity of complementary crops at large scales?

Aims of the study

- To investigate the effects of crop connectivity on carabid communities, relative to those of connectivity of semi-natural habitats.
 - Positive effect of connectivity of asynchronous crops on crop species ?
 - Antagonist effects of connectivity of forest habitats on crop and forest species ?

Study area and data collection



Carabid sampling in 27 landscapes (1km^2)

- Hedgerows, woodlots, permanent and temporary grasslands (2011)
- Wheat, maize (2012)

$N = 240$ (2 replicates / landscape)

Data analysis



Carabid communities

Indicator species

Forest

Grassl.

Wheat

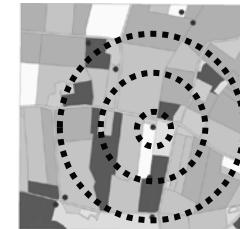
Maize

IndVal method

Random forest
↔

Best model
GLMm

Landscape metrics (50m, 250m, 500m)



- Habitat amount (% woody, grassl., wheat, maize)
 - Habitat connectivity :
 - Edge length between habitats (m)
 - Connectivity metric
- $$C = \sum e^{-d_{pq}} \times A_q$$
- (Hanski & Thomas 1994)
- Shannon diversity index

Results : Effect of landscape metrics on indicator species

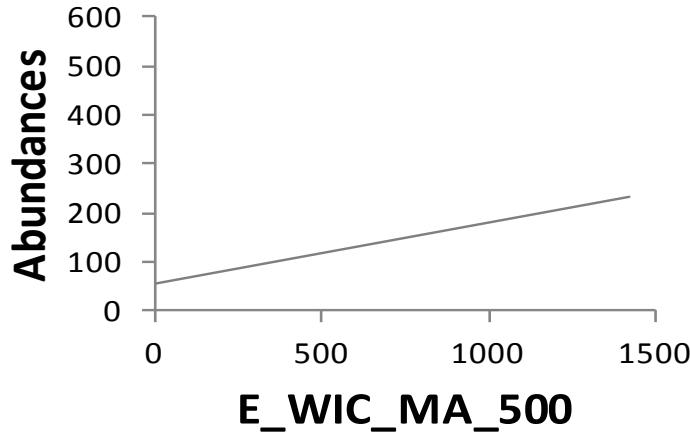


□ Maize species

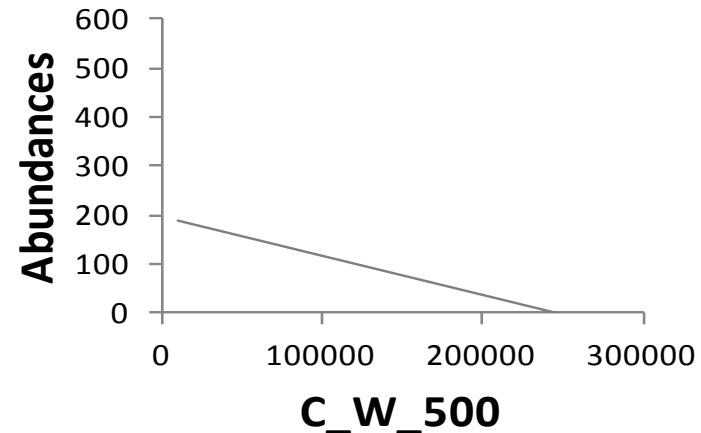
Best model (GLMM)

Variable	P-value	<i>AICc</i> model	<i>AICc</i> null	Pseudo <i>R</i> ²
(intercept)				
C_W_500	<0.001	440.43	462.58	0.48
E_WIC.MA_500	<0.001			

Positive effect of edge length
winter crops-maize (500m)



Negative effect of woody
habitats connectivity (500m)



Results : Effect of landscape metrics on indicator species

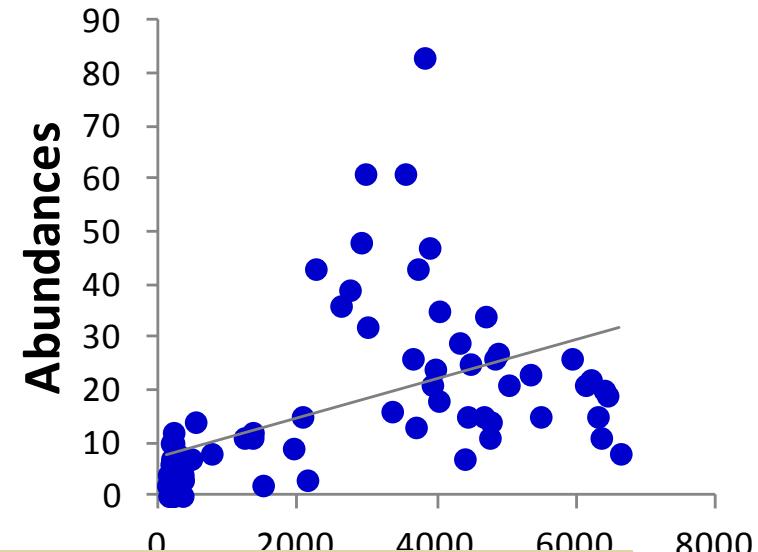


□ Forest species

Best model (GLMM)

Variable	P-value	AICc model	AICc null model	Pseudo R ²
(intercept)				
C_GR_50	NS			
C_W_50	<0.001	566.1	612.98	0.484
SHDI_50	<0.001			

Positive effect of woody habitats connectivity (50m)



Wheat and grassland species : no significant effect of tested landscape metrics

Conclusions

- ❑ **Connectivity of crops matters for maize carabid species**
 - ❑ Adjacencies between asynchronous crops (spring vs. winter crops) at large scales (500m) : complementation processes
- ❑ **Antagonist effects of connectivity of semi-natural habitats?**
 - ❑ Promotes forest species at local scales (50m) but reduces crop species at large scales (500m)
 - ❑ But the role of semi-natural habitats (hedgerows) remains important for crop species locally (refuge, overwintering...)
- ❑ **Management perspectives: Green and blue networks policies**
 - ❑ Different types of ecological continuities depending on targeted species and services (conservation vs. regulation)



Thank you

