Conserving butterflies in plantation forests

Inge van Halder, Luc Barbaro and Hervé Jactel

International Symposium Future of Butterflies in Europe III, 29-31 March 2012

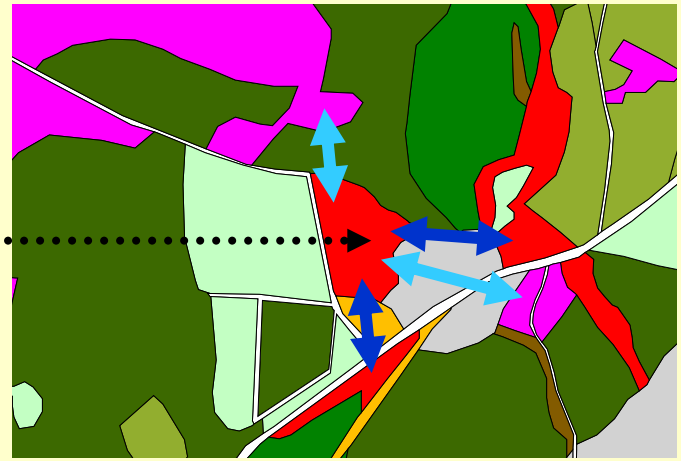
Plantation forests and Biodiversity

Conserve and improve biodiversity in Plantation forests

➡ Identify key factors that drive patterns of biodiversity

Local level:

habitat quality / quantity



Landscape level:

Landscape composition & structure

metapopulation, complementation, supplementation

Research questions:

Part 1

Do habitat types in a pine plantation landscape differ in butterfly richness and composition?

- What is the relative importance of:
  - plot variables,
  - habitat-type,
  - landscape variables

  on butterfly community composition?

Part 2

- Do edge and interior habitats differ in butterfly richness and community composition ?

Study area

Landes of Gascony Forest, south-west France
Landscape dominated by 1 million ha of even-aged Maritime pine plantations

Stratified sampling of the 7 main habitat types

5 stages of pine plantations:

herbaceous clearcuts

bushy clearcuts

young pines (< 7m)

mid-class pines (7-15m)

older pines (>15m)

2 semi-natural habitat types:

firebreaks

deciduous woodlands

Total of 83 plots

Butterfly surveys

Per plot a transect of 400 m long and 5 m wide, visited 4 times (May-June-July-August).

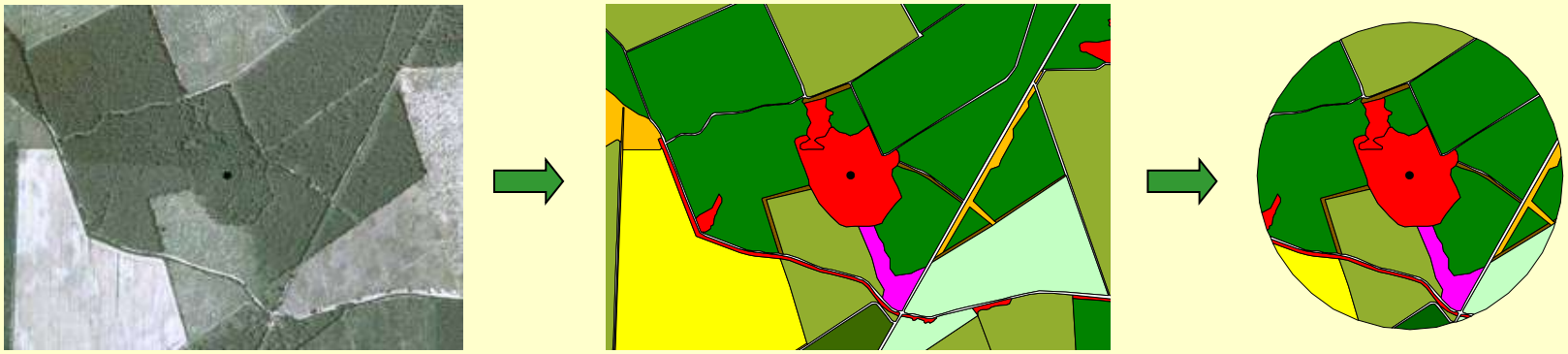
Environmental variables

- **Habitat type** (7 types)

- **Plot variables (14 variables)**
  - Flower abundance of nectar plants
  - Soil moisture
  - % bare soil
  - % cover of main vegetation components in herbaceous and shrub layer

- **Landscape variables (13 variables)**

GIS mapping of 12 land-use types based on aerial photos. Extraction of circular buffers of 50 ha (radius 400m) around each plot centre



Calculation of 13 landscape variables : % cover of 7 main habitat types + 6 variables for landscape heterogeneity and fragmentation

Results

83 plots: 44 species - 2750 individuals

7 forest species:

2 abundant species

Pararge aegeria
181 ind

Gonepteryx rhamni
95 ind

5 rare species < 15 individuals

L. reducta

A. pahia

S. ilicis

N. quercus

L. camilla

Species of conservation interest:

	Coenonympha oedippus	*Euphydryas aurinia*	*Hipparchia statilinus*	*Lycaena alciphron*	*Boloria selene*
Habitat Directive	II/IV	II			
European Red Data Book (1999)	CR	VU			
European Red List (2010) Europe	EN		NT		
European Red List (2010) EU27			NT	NT	
Red List France (2012)	NT				NT

C. oedippus

236 ind

E. aurinia

118 ind

H. statilinus

79 ind

L. alciphron

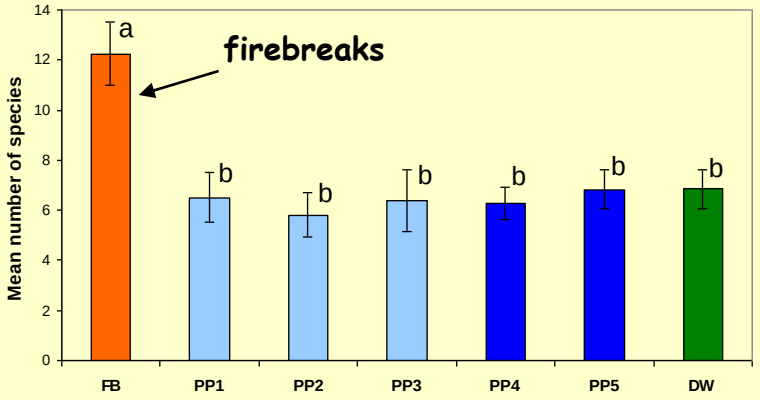
11 ind

B. selene

12 ind

Species richness

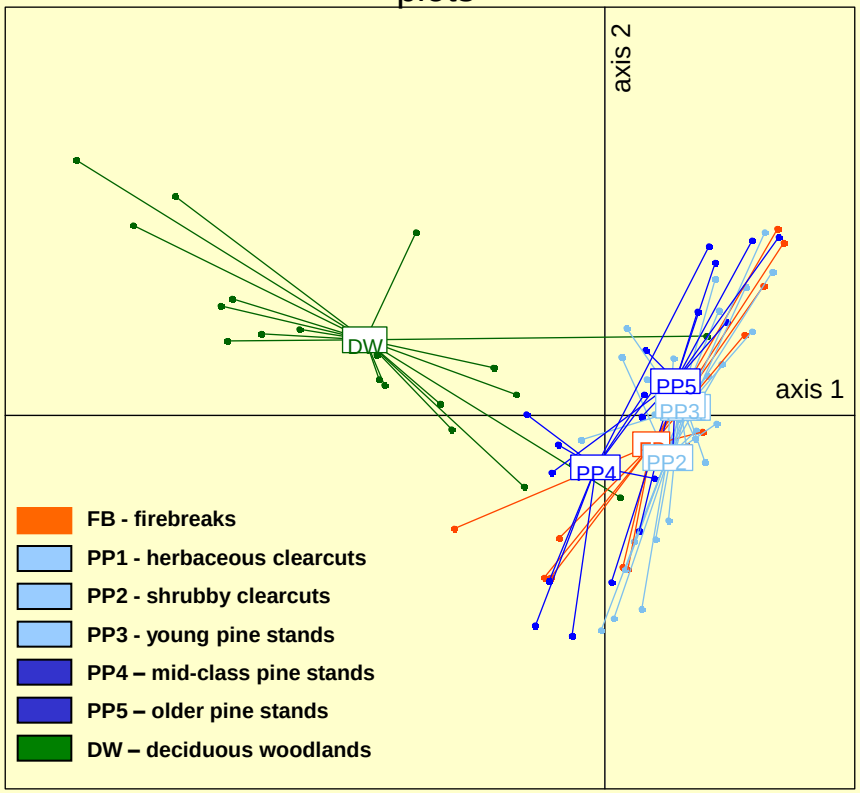
Higher richness in firebreaks, other habitats similar



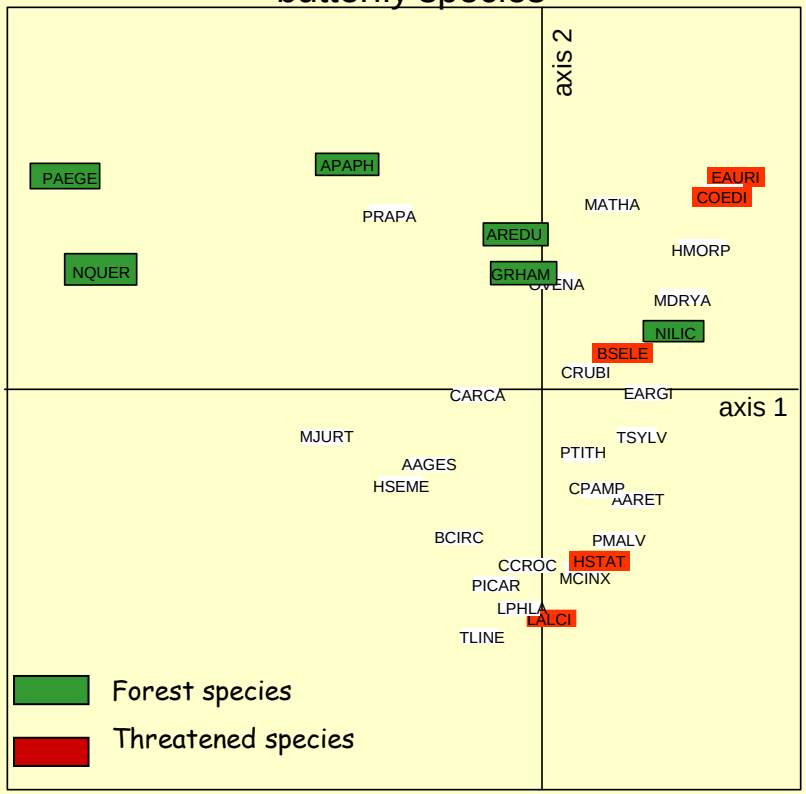
Community composition (CA)

separation of deciduous woodlands, regrouping of other habitats

plots

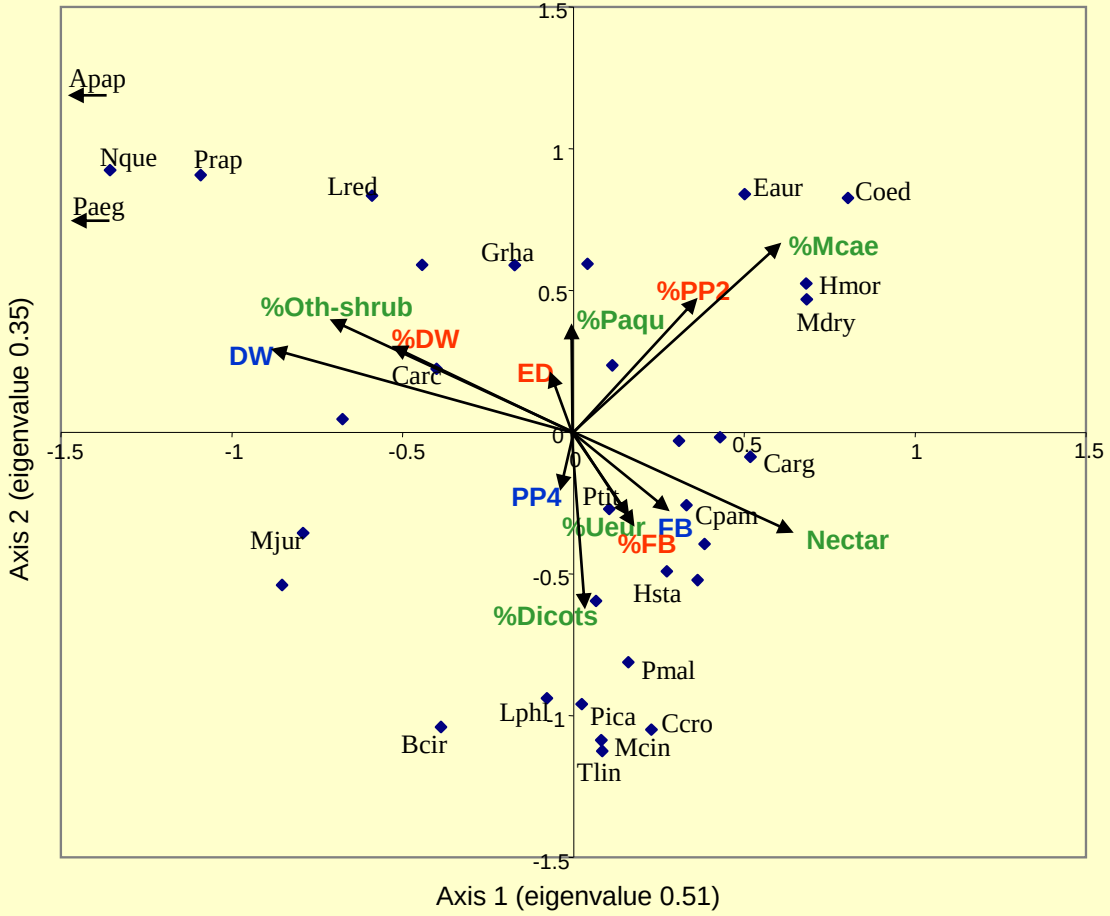


butterfly species

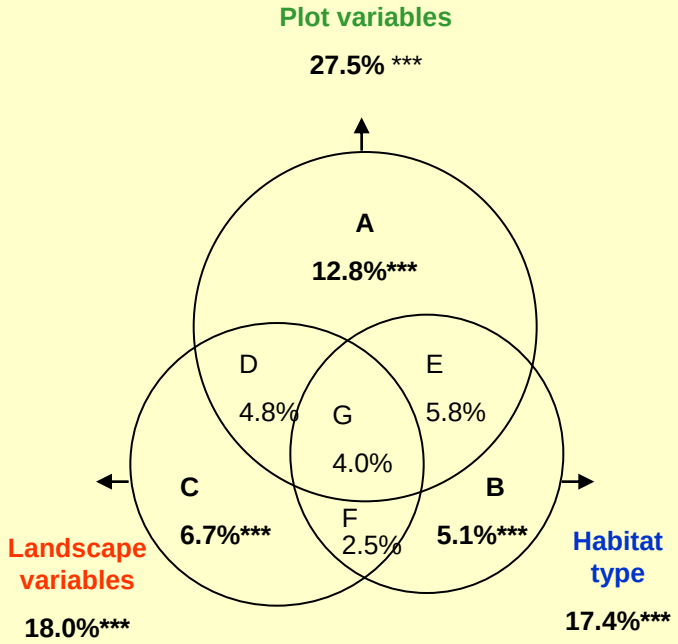


Importance of environmental variables

CCA

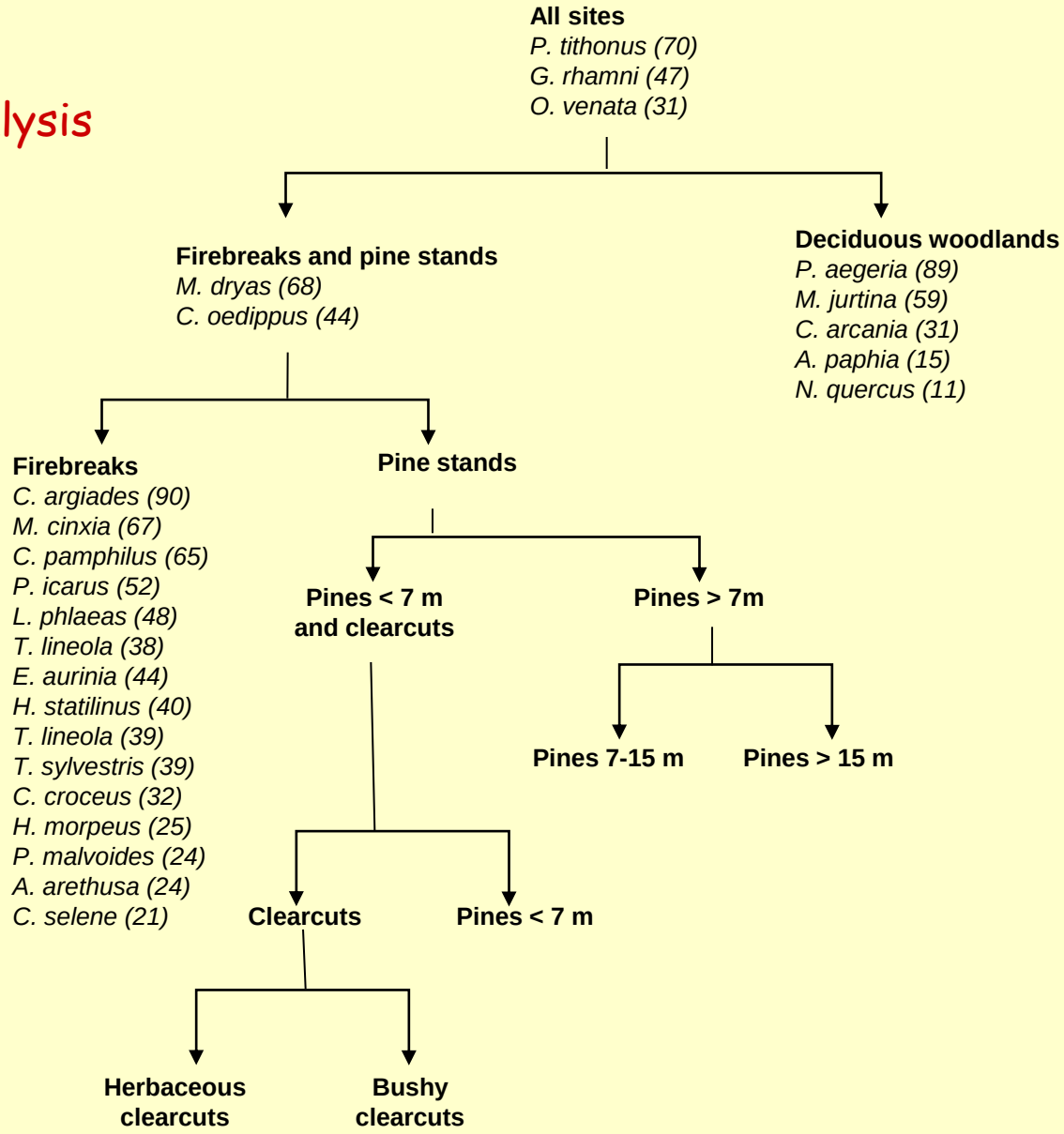


partial CCA



Communities in pine stands/firebreaks related to vegetation type (soil humidity)

Indval analysis



Conclusions part 1

Semi-natural habitat types (firebreaks and deciduous woodlands) are important for butterfly conservation

Pine plantations stands are not an ecological desert, presence of threatened species

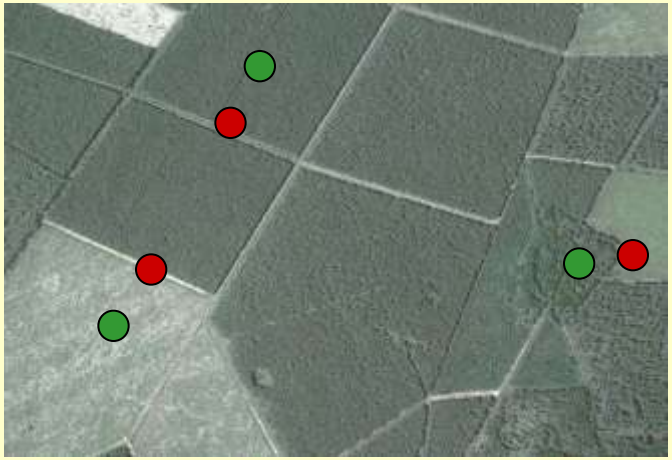
Butterfly community composition in pine stands and firebreaks depends principally on (understorey) vegetation composition (linked to soil humidity)

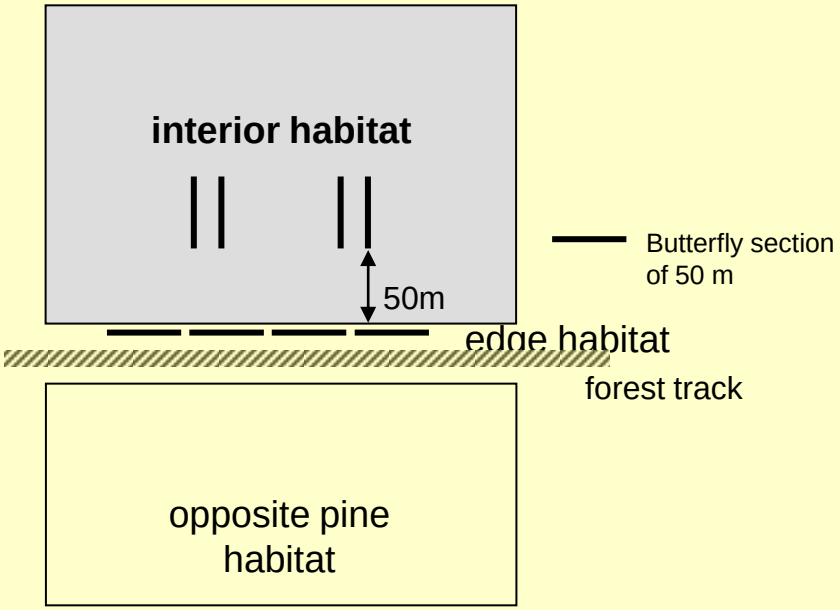
Independent effect of landscape variables on butterfly communities (% DW, % FB, ED)

(van Halder et al. (2008) Biodivers Conserv 17: 1149-1169)

Part 2: Importance and role of edges

Surveys at edges and inside patches





68 patches - 4 habitat types – same method as in part 1, (200 m transects)

Firebreaks

clearcuts & young pines
(Open pine stands)

Older pines (>7 m)
(Closed pine stands)

Deciduous woodlands

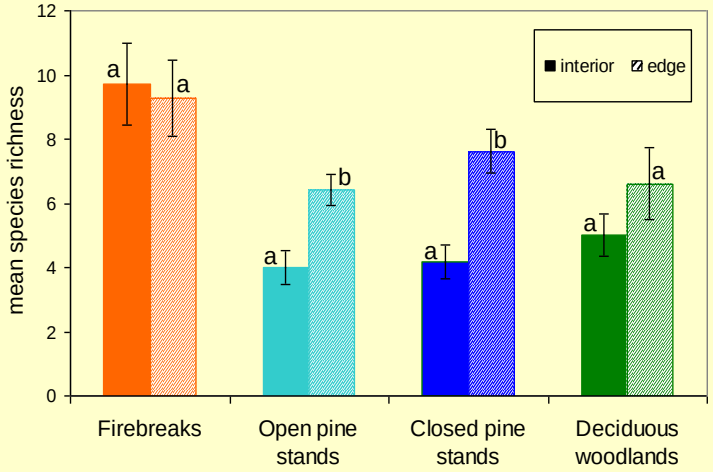
Results

47 species

2886 individuals

Species richness

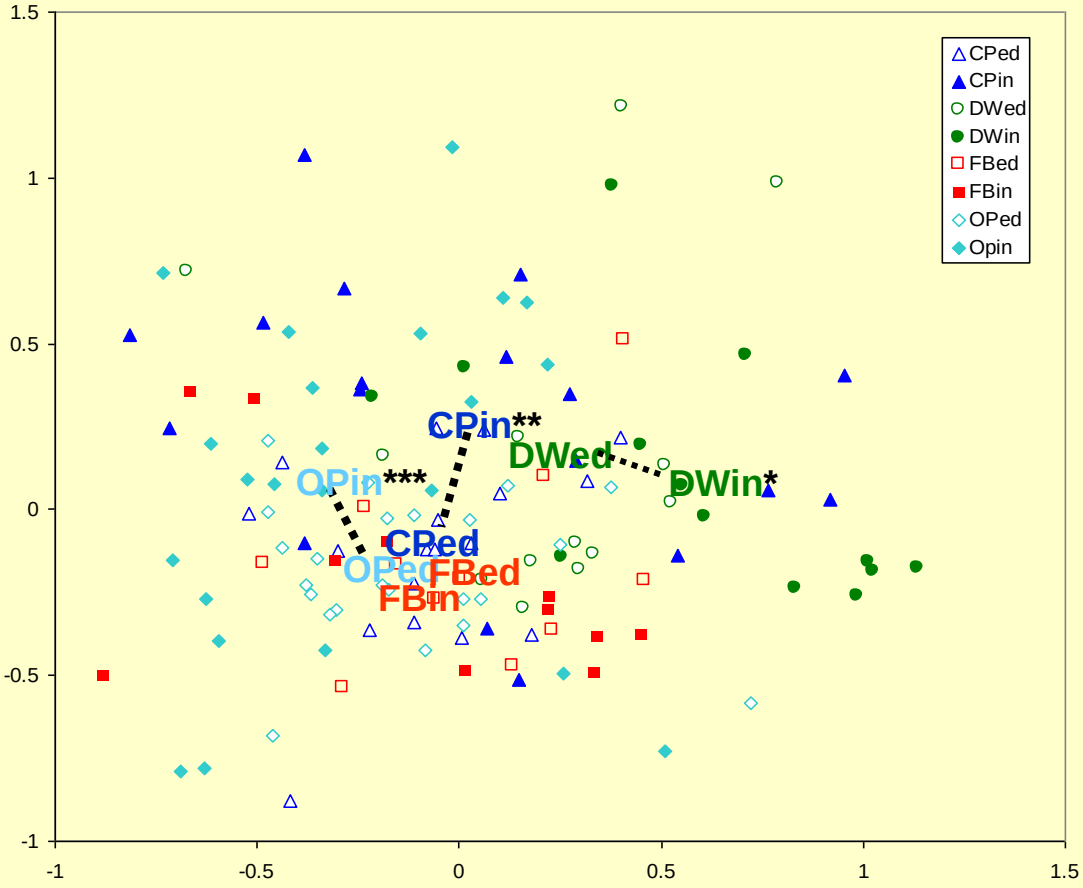
Higher richness at edges, especially at edges of pine stands



Community composition (NMDS & MRPP)

Difference between edge and interior for:

- all plots
- pine stands
- deciduous woodlands

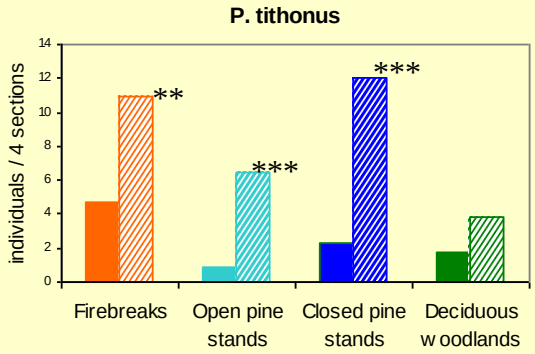


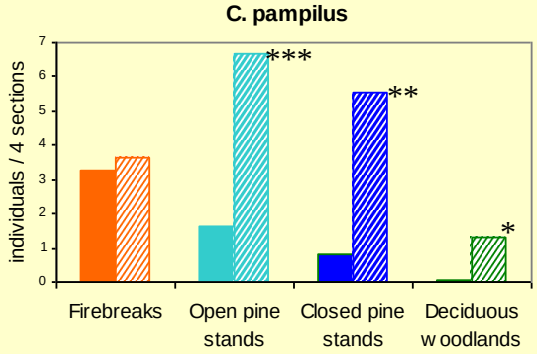
Interior-edge preferences per species

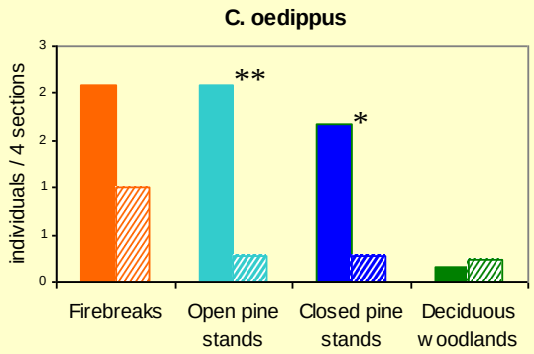
23 species tested : 7 preferred edges, 5 interiors and 11 no significant preference

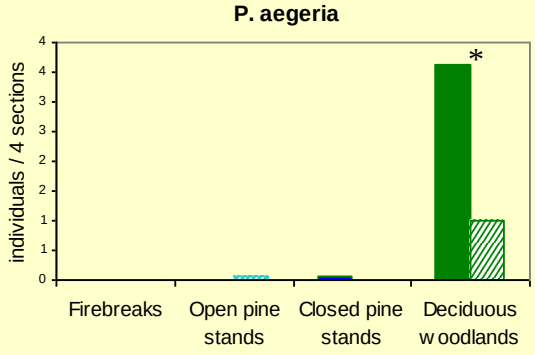
all habitats		firebreaks		open pine stands		closed pine stands		deciduous woodlands	
int	edge	int	edge	Int	edge	int	edge	int	edge
3	5	2	1	1	6	1	2	1	2

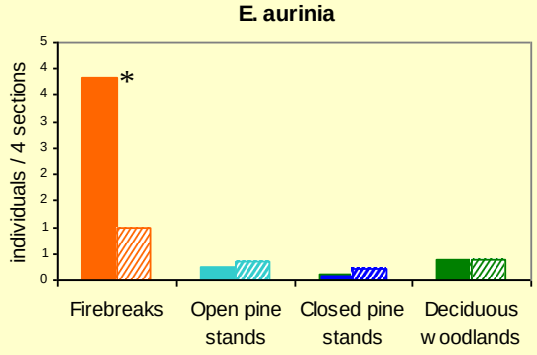
Some examples of patterns: interior edge

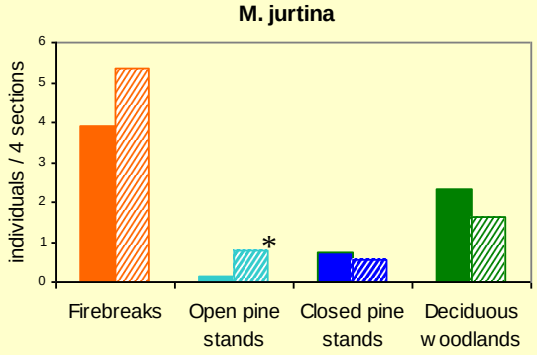












Conclusions part 2

Edge habitats have a higher species richness and a different community composition, but some species prefer interior plots

Edges can be a habitat (all resources present) or part of a habitat

Many species are found in several patch types where they use the same or different resources ->
use of several habitats is probably a key process in these mosaic landscapes for butterfly conservation

(van Halder et al. (2011) J Insect Conserv 15: 591-601)

Thanks to Audrey Lugot, Karine Payet and Emmanuel Corcket for their help

Thank you for your attention