



**Flexible habitat use of an open-habitat bird species in a farmland-woodland landscape of southern Belgium**



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# Ardenne region

Mosaic landscape of farmland and woodland





# Ardenne landscape : open-habitats

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Farmland dominated by intensive grassland  
(pastures and hay meadows)



# Ardenne landscape : open-habitats

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For few decades, open-habitats are also found in woodland due to clear-cut patches in plantation forests





# Ardenne landscape : open-habitats

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## Christmas tree plantations (CTP)

- non-food perennial crop
- grassland → CTP
- *ca* 3 200 ha in Wallonia



# Open-habitat bird species

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Clear-cut patches = temporary open-habitats that are colonized by some bird species usually associated to farmland

(e.g. Zmihorski & al., 2016)

Christmas tree plantations enhance abundance of farmland birds in grassland with low hedge density

(Gailly & al., 2017)



# Bird density $\neq$ habitat quality

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Fast anthropogenic modifications of the environment

- first way for organisms to respond is behavioral flexibility

Birds rely on environmental cues for habitat selection

- their choice may be maladaptive if the cues become uncoupled from the underlying habitat quality

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## Review

*Trends in Ecology & Evolution* September 2013, Vol. 28, No. 9

# Ecological novelty and the emergence of evolutionary traps

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# Research question

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Is habitat selection adaptive ?

1. Habitat preference
2. Habitat quality -> Individual fitness



Stonechat *Saxicola torquatus*



Christmas tree plantations



Grassland



Clear-cut patches



# Habitat preference

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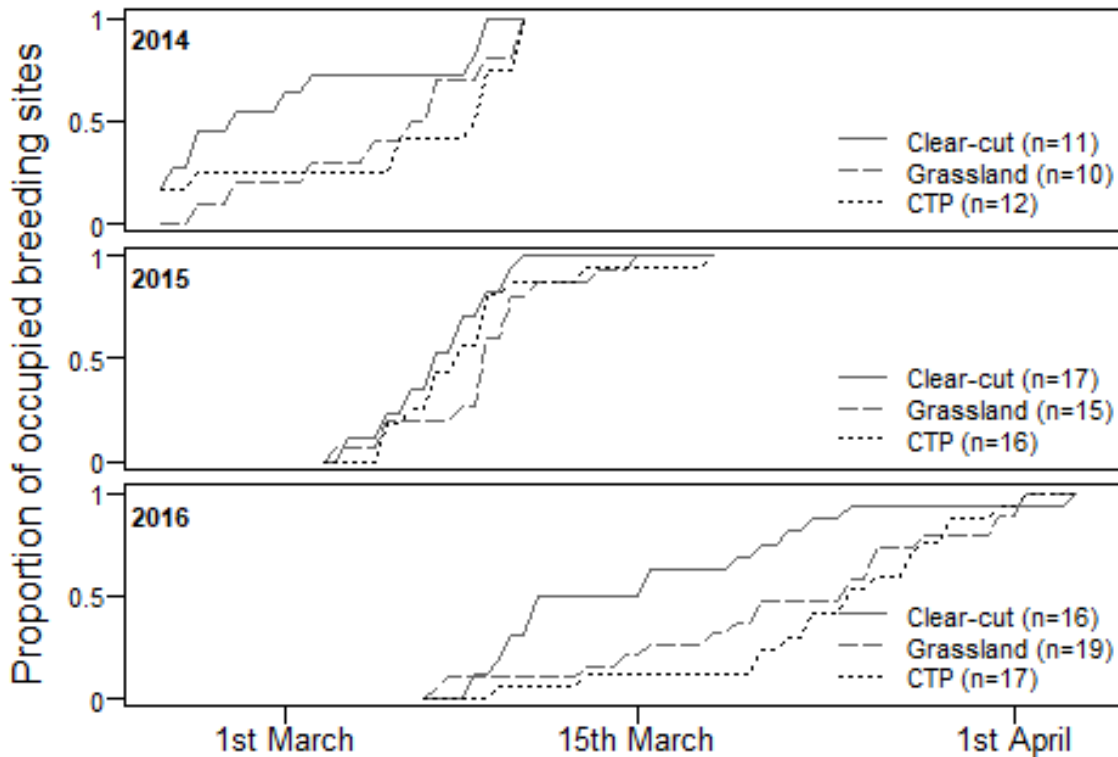
Order of male settlement on their territories (Robertson & Hutto, 2006)

- 2014, 2015, 2016
- *ca* 20 breeding sites per habitat
- visit every two days to record occupancy

# Habitat preference

## Results :

- inter-annual difference due to weather conditions
- preference for clear-cut patches



## Arrival date

	F	df	p-value
habitat ***	6.1	2	0.004
year ***	138.4	2	<0.001
habitat : year	2.3	4	0.061



# Habitat quality - Reproduction

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## Reproductive performances

- 2014 – 2016
- total of 215 breeding pairs under survey
  - number of successful breeding attempts
- search for nests
  - brood size (n = 147)
- offspring quality
  - nestling body conditions (weight & tarsus length) at 10-12 days old (n = 557)

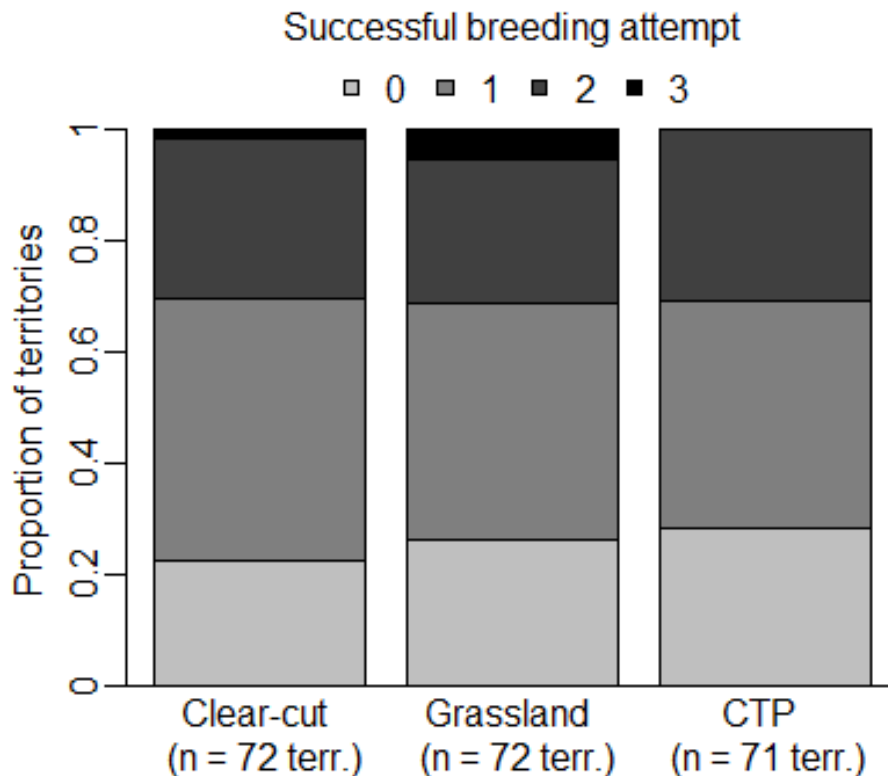


# Habitat quality - Reproduction



Number of successful breeding attempts per pair

- from 0 to 3 on a breeding season
- no difference between the 3 habitats



	Number of successful breeding attempts		
	Chisq	df	p-value
habitat	0.3	2	0.861
year	5.3	2	0.071
habitat : year	4.1	4	0.389

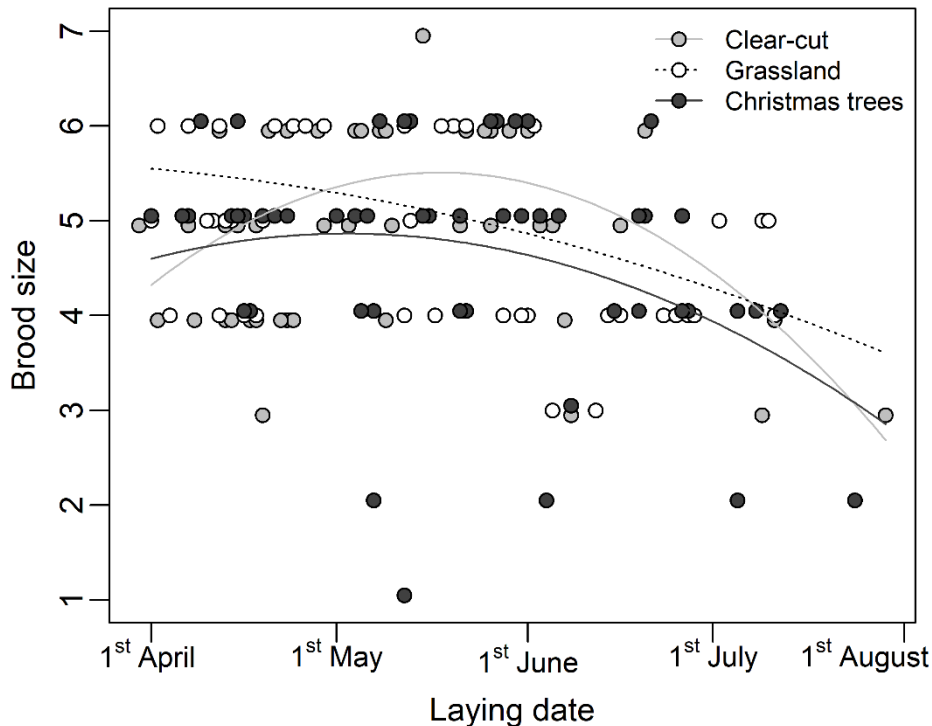


# Habitat quality - Reproduction



## Brood size

- from 1 to 7 nestlings
- decrease with the course of the breeding season
- no difference between the 3 habitats



## Brood size

	Chisq	df	p-value
habitat	0.4	2	0.811
year *	7.7	2	0.021
laying date *	5.6	1	0.018
laying date <sup>2</sup> ***	13.9	1	<0.001
interaction terms	-	-	>0.070

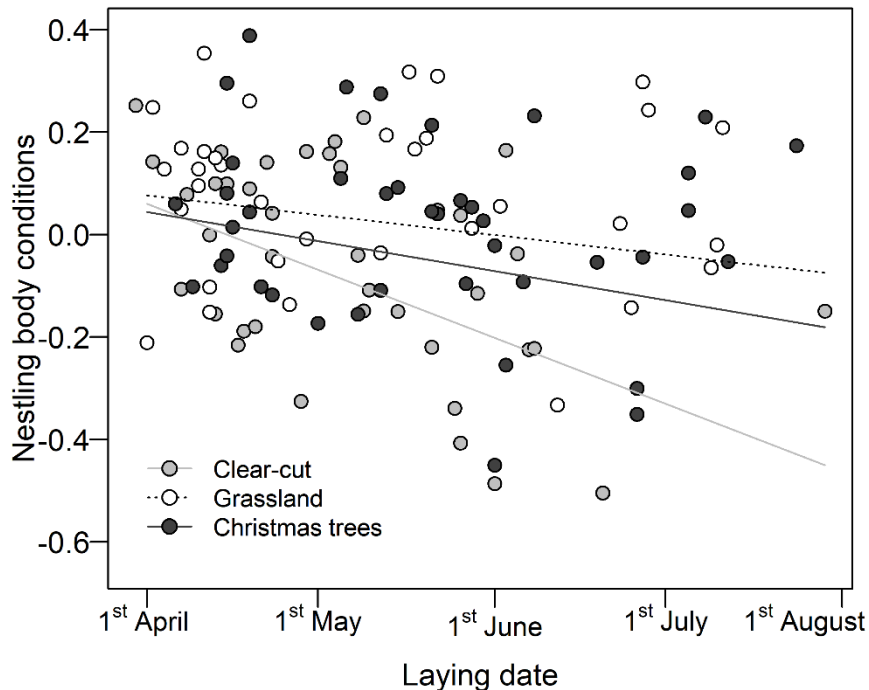
# Habitat quality - Reproduction

## Offspring quality

- similar in grassland and CTP
- decrease with the course of the breeding season in clear-cut patches

Nestling body conditions (mean per nest)

	Chisq	df	<i>p</i> -value
habitat *	7.6	2	0.019
year	4.2	2	0.124
laying date *	6.5	1	0.011
habitat : laying date *	13.9	2	0.030
habitat : year	4.3	4	0.372





# Habitat quality - Survival

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## Survival rates

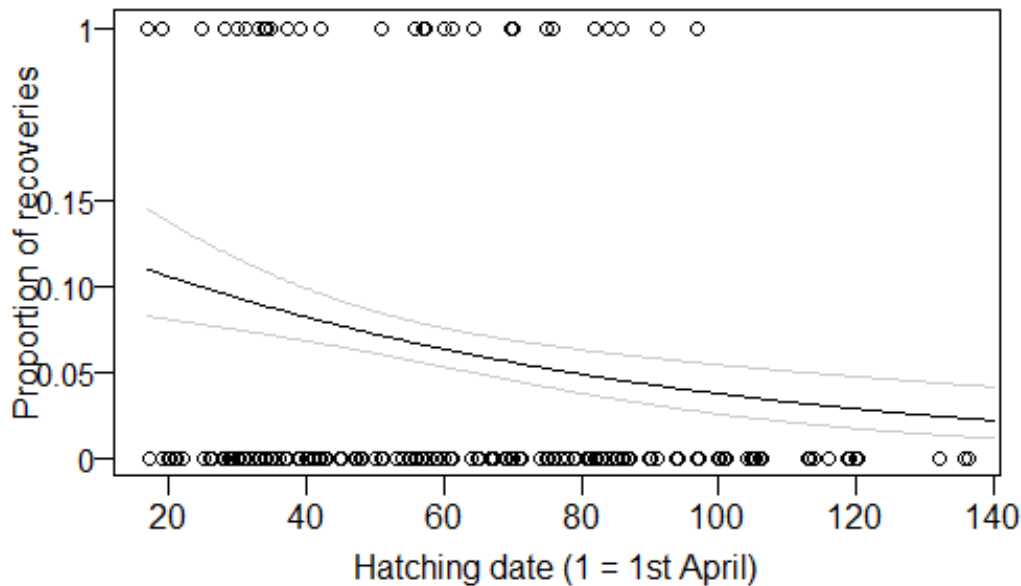
- Capture-Mark-Recapture (2014-2018)
- 319 adults with colour-rings
- 729 nestlings that fledge successfully with metal ring
- each year, search for ringed birds in the 145 km<sup>2</sup> study area
- spatial Cormack-Jolly-Seber models (Schaub and Royle, 2014)



# Habitat quality - Survival

## First-year survival rate

- 19 %
- no difference between habitats
- no effect of nestling body conditions
- decrease with the laying date



## First-year survival

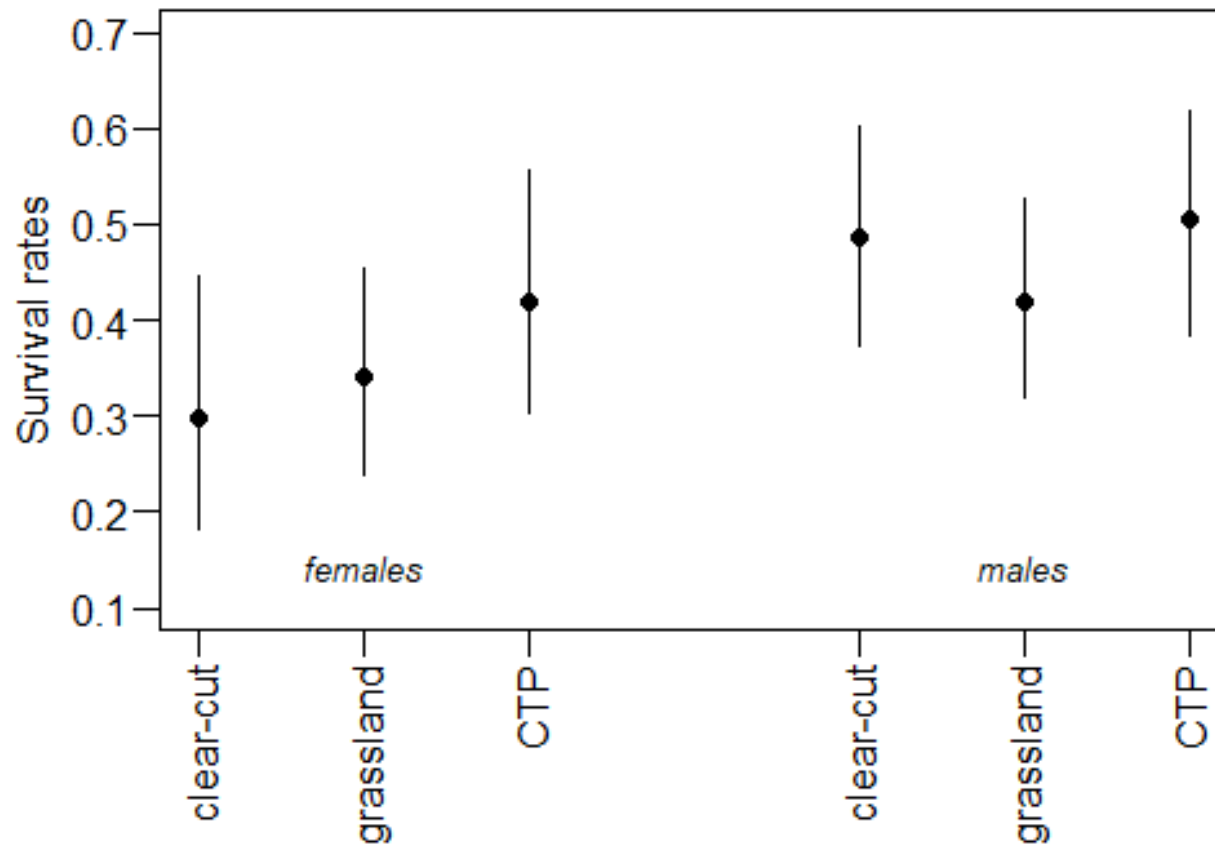
	Chisq	df	p-value
habitat	3.3	2	0.188
year	3.5	2	0.177
laying date *	4.4	1	0.036
nestling body cond.	0.2	1	0.661
interaction terms	-	-	0.517



# Habitat quality - Survival

## Adult survival rates

- males = 47 % > females = 36 %
- quite similar between habitats



# Conclusion

Clear-cut patches are attractive for some open-habitat bird species usually associated to farmland

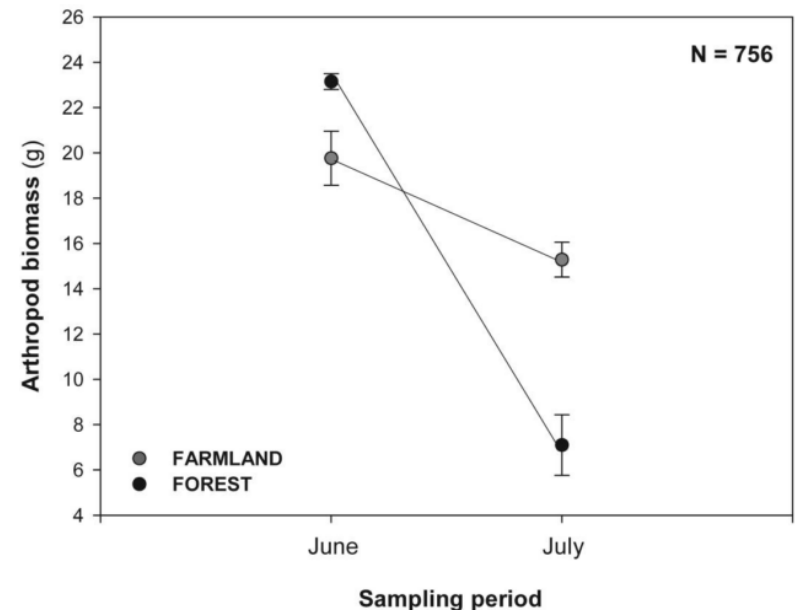
But this is not explained by a higher fitness of individuals

On the opposite, lower nestling body conditions probably due to a decrease of arthropod biomass during the breeding season

Ecological trap ?

- not for Stonechats
- previously demonstrated for the Red-Backed Shrike

(Hollander & al, 2011)



(Hollander & al., 2017)



# Conclusion

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Preference for clear-cut patches

- recall historical habitat = natural disturbances in forests



<https://alpac.ca>

CTP and grassland are similar in terms of functionality despite of important differences in vegetation structure and management

- Flexible use of (novel) anthropogenic habitats
- Importance of measuring several fitness components

Thank you for your attention !



## References

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