

Effects of local habitat characteristics and landscape context on grassland and wasteland use by birds in and around cities

Urban wastelands: a form of urban nature ?
21st-22nd May 2019, Tours



Joséphine Pithon, Rémi Duflot,
Véronique Beaujouan,
Guillaume Pain et Hervé Daniel

Context

Bird diversity in urban contexts?



- City scale studies of urban birds most common
- How do **single habitats** contribute? Often focus is on woodland habitats or gardens...
- Previous studies: **quantity and spatial arrangement of habitats are key**, in addition to local management and habitat characteristics
- Land planners and managers need this information to guide biodiversity conservation in and around cities.

Context

Bird diversity in urban grasslands?



- **Many forms of grassland** exist in urban areas
- Occupy **large surface areas** and may contribute to biodiversity conservation
- Many studies of birds in urban contexts but few focus on this type of habitat
- A few studies ask « why do some bird species of open and grassland habitats not penetrate urban landscapes ? »

Objectives

How do birds use grassland habitats along the rural-urban gradient?



In **extensively managed grasslands**:

- How do **species richness and abundance of birds** vary in grasslands according to:
 - **Local habitat** characteristics, land use;
 - **Landscape context**: level of urbanisation, quantity of gardens
- How does **use of grasslands by birds for foraging** vary?

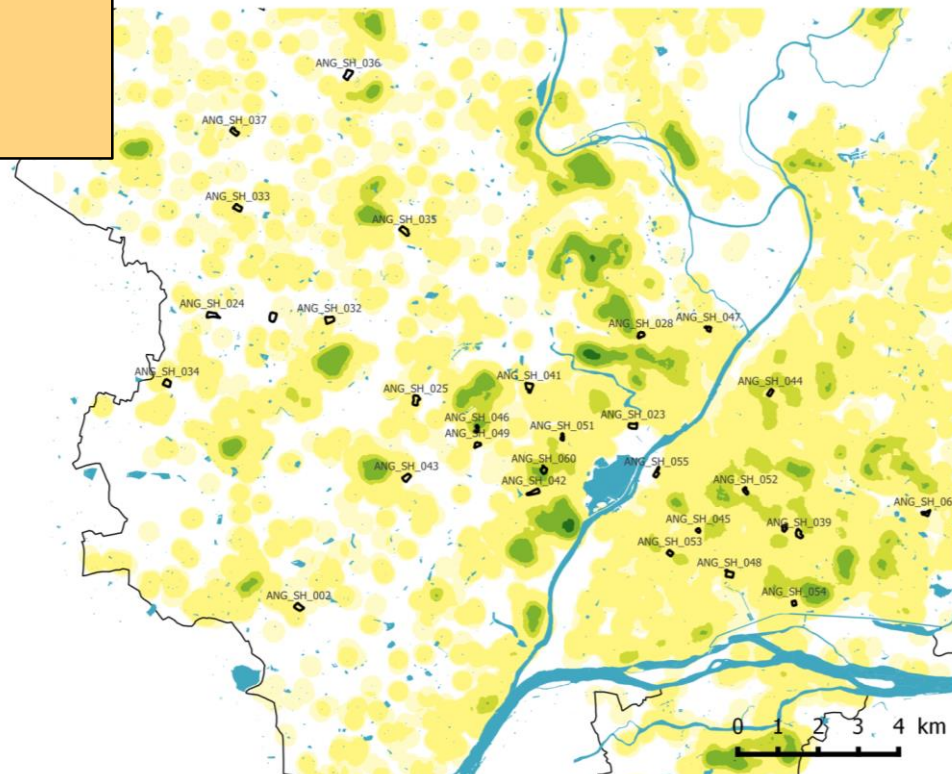
Methods

Study areas and site selection



- **Two medium-sized cities and their rural-urban interfaces**
- Extraction of probable grassland sites using automatic classification of satellite imagery within land cover classes (NDVI, BD Topo)

Densité de jardins privés (%)
dans une fenêtre mouvante circulaire de rayon 250 m



Légende

Sites échantillonnés



Jardins privés (%)

0

20

30

50

70

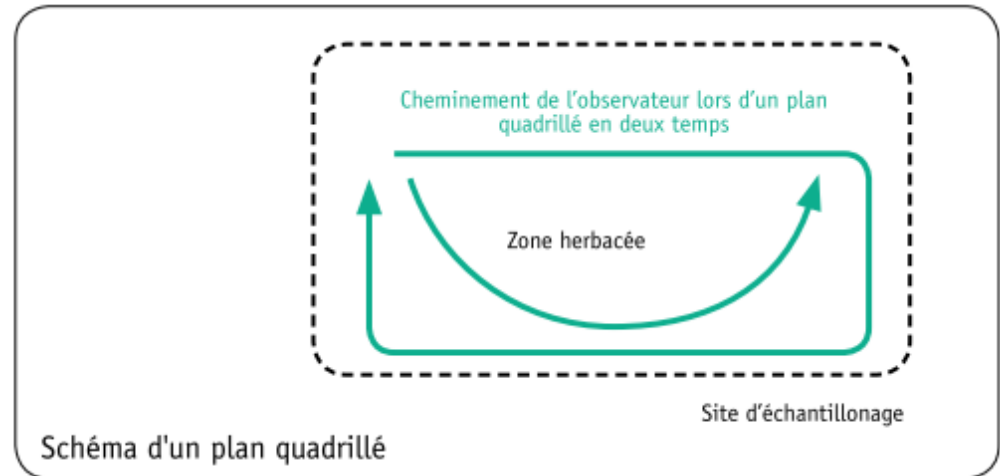
0 1 2 3 4 km

47 sites selected and sampled:

- Sites <1ha or close to large water bodies and forests excluded
- 6km gradient in Angers, 11km in Nantes
- Ground truthing
- **to maximise variation in proportion of built land and gardens in the landscape**

Methods

Bird and local habitat sampling



Fiche descriptive de l'habitat

Département	Commune	Noms de la parcelle	Observateur	Date
		Ang_U1	Vo	25/07/2014

Structure de la végétation

1-Type de station (% de l'espace occupé)

Parc, jardin	
Prairie fauchée	X
Terrain de sport	
Friche	
Autre (préciser)	

2- Familles présentes

Famille	Absente	Peu abondante	Abondante
Graminées			X
Fabacées			X
Apiacées			X
Astéracées			X
Renonculacées	X	X	
Orchidacées	X		

3- Diversité sur une bande de 10m x 2m

Nombre total d'espèces distinguées	Recouvrement du sol en mousse
20	
Commentaires (dominance d'une espèce ou famille) :	
Graminées	

4- Eléments de la parcelle à localiser sur la carte

Eléments de la parcelle	Présence	Absence
Arbre isolé *	X	
Roncier	X	
Flaque d'eau, marre, ornière		
Bâti	X	
Fossé		
Talus		
Espace boisé, bosquet	X	

* Description des arbres isolés :

	Présence	Absence
Essence fruitière	X	
Essences allochtones	X	
Mousse et lichen		
Lierre	X	
Trous et cavités		
Branches mortes		

5- Eléments du paysage adjacent à la parcelle (culture, bâtis)

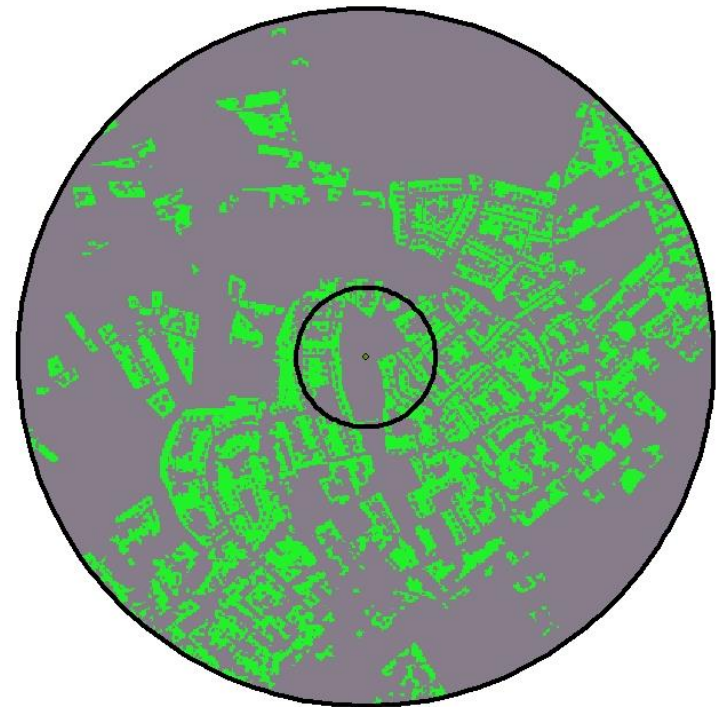
A	B	C	D
Prairie	Habitations	habitations	XXX

- **2 years, 3 visits (April – May – June)** mapping of all bird observations
- **Activity codes** for each observation (territorial behaviour, foraging...)
- **Habitat survey** (structure and composition, land use)
- At 21 sites, **mean grass height**

Methods

Spatial analysis of landscape context

- Landscape variables are: proportions of built land, private gardens, grassland, woodland
- Two spatial scales (200 and 1000m buffers)



Methods

Multiple regression analysis

Multi-model Inference (MMI) and model averaging (*Burnham & Anderson 2002*)

- relative influence of land use, local habitat and landscape
- species richness, abundance and foraging behaviour

Site use	Local habitat variables	Landscape variables
Grassland use categories: Recreational, Wasteland, Agricultural	Presence/absence of water, significant coniferous vegetation, significant non-native vegetation, scrub or woody vegetation within the grassland. Vegetation structure Mean scrub/woody vegetation height, Total area covered by scrub and/or trees Mean grass height in May/June (<i>21 sites only</i>)	% woodland, grassland, urban, gardens in a 200m buffer % woodland, grassland, urban, gardens in a 1000m buffer

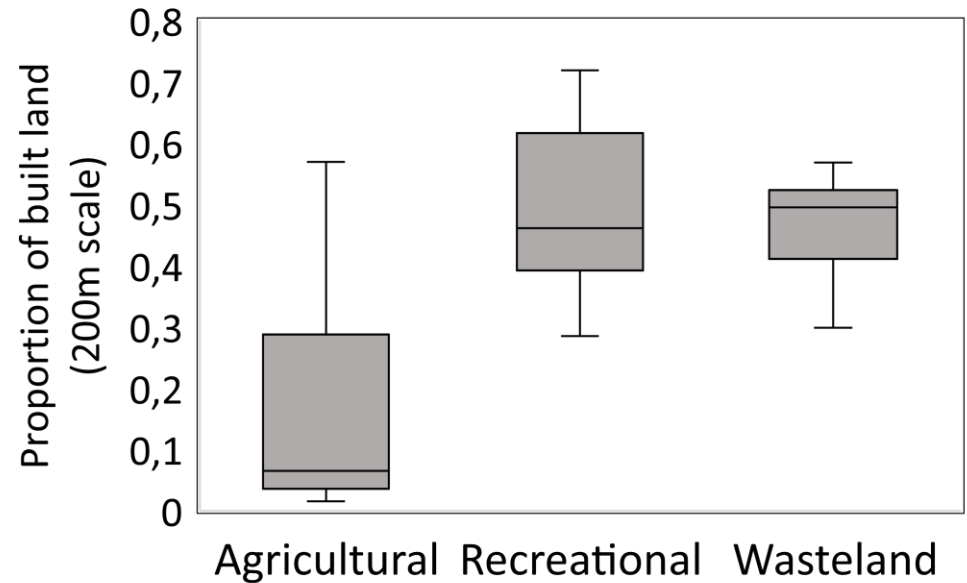
Results

Grassland use along the gradient

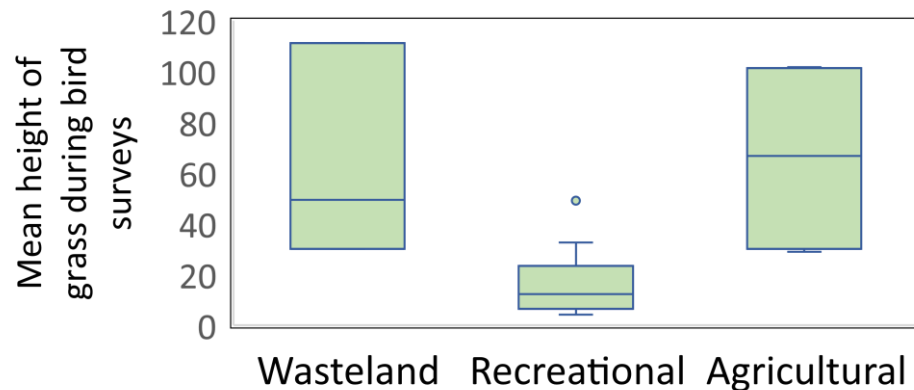
47 sites, land use types unevenly distributed along the urban-rural gradient :

- 19 Agricultural and only 2 in urban contexts
- 21 Recreational exclusively in urban and periurban contexts
- 7 Wastelands in urban contexts

Urban context and grassland use



Mean grass height of different grassland types



Mean grass height does not differ between wasteland and agricultural sites but sites managed for recreational purposes have shorter grass

Results

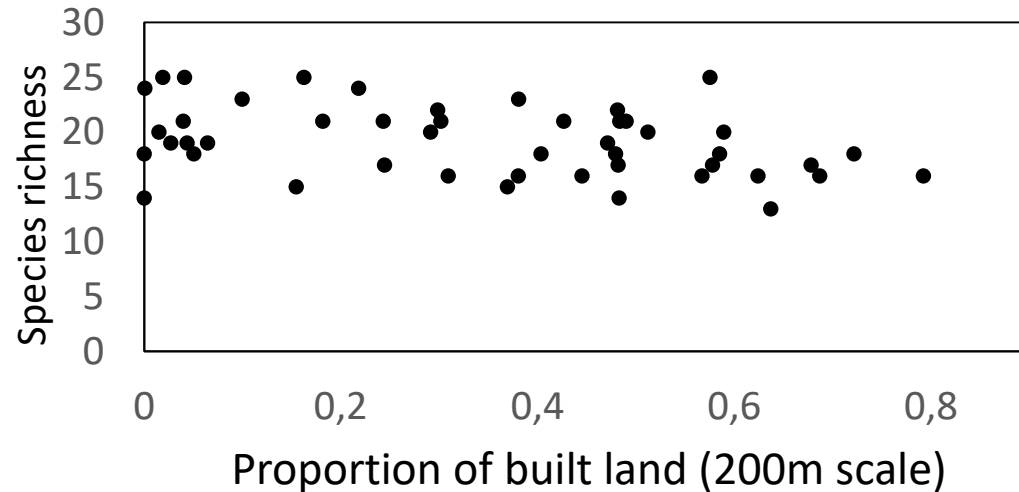
Overview of multiple regression results

Bird variable	Local variables – <i>significant effects</i>			Landscape variables – <i>significant effects</i>		
	Variable	p-value	Direction of effect	Variable	p-value	Direction of effect
Spp. richness	Presence of scrub within the grassland	0.03	+			
	Mean scrub/woody vegetation height	0.02	+			
	<i>Recreational use</i>	<i>0.06</i>	-			
Abundance	<i>Total area of wood and/or scrub</i>	<i>0.06</i>	+	% gardens at 1000m scale	0.01	+
Ground foraging	Woody vegetation within the grassland	0.02	-	% woodland at 1000m scale	0.05	-
	Recreational use	0.01	+			

Results

Less species but more ground feeding in recreational grasslands

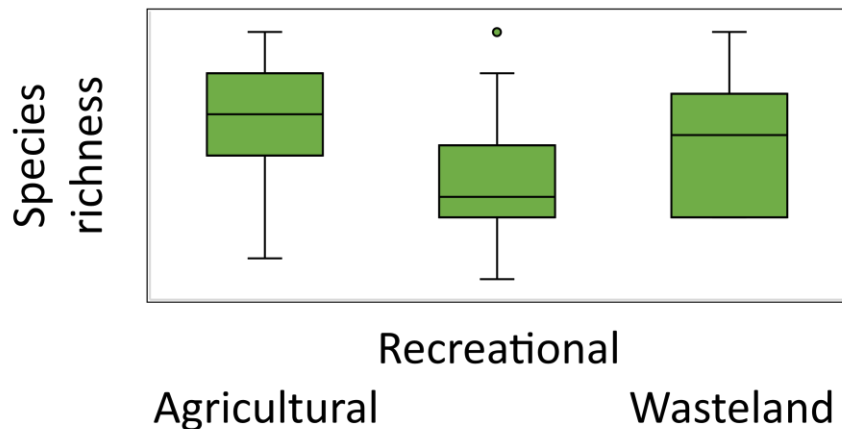
Species richness along the rural-urban gradient



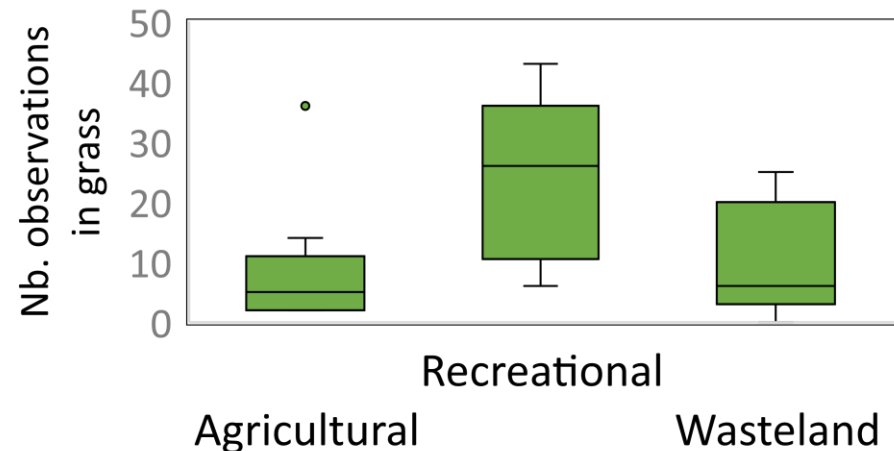
There is a slight (though significant) decline in species richness in urban contexts which is apparent in recreational sites **but not in wastelands**.

Recreational sites have fewer species but more ground foraging

Species richness according to grassland use

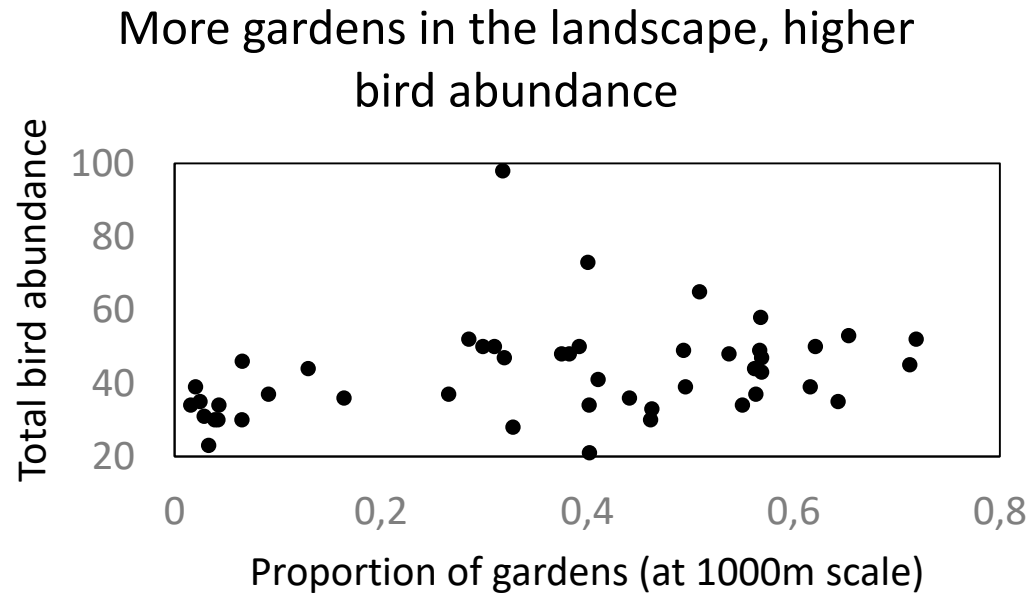
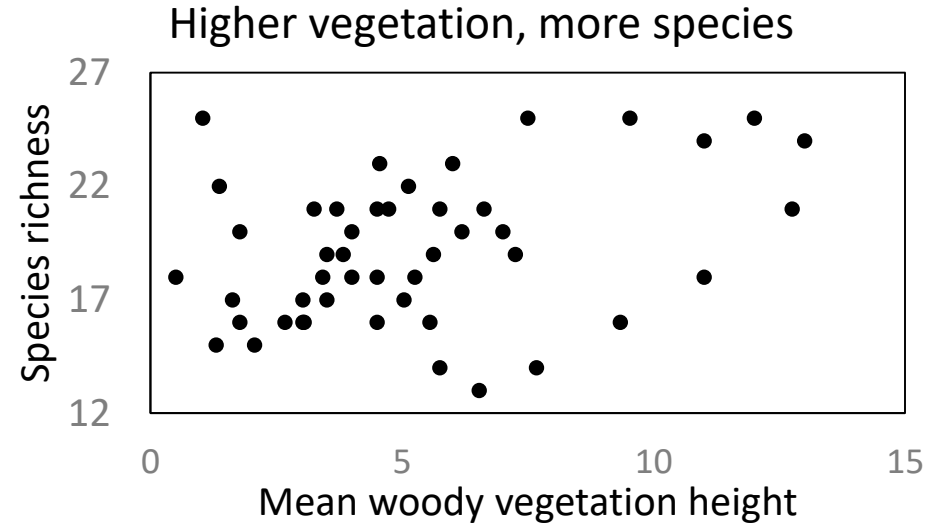
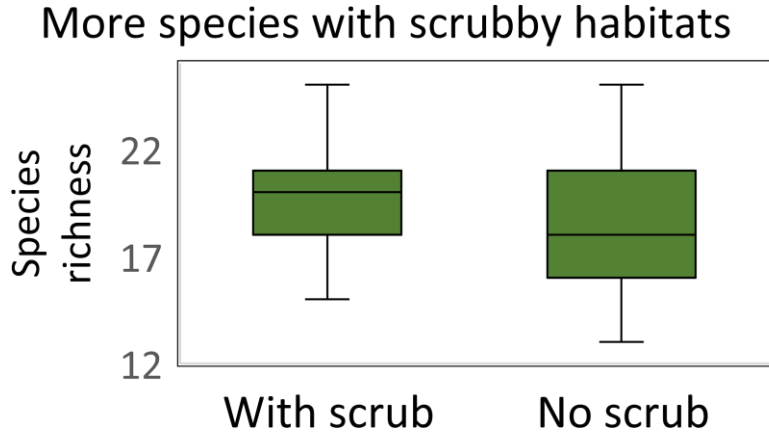


Foraging observations according to grassland use



Results

Local factors influence richness, landscape context influences abundance



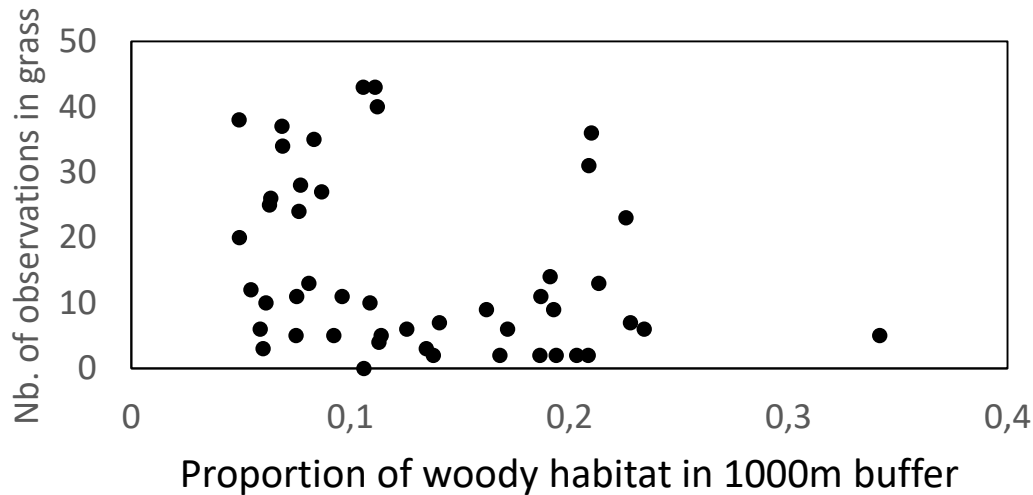
Results

Ground foraging species tend to prefer open habitats at site (local) and landscape (1000m) scales

More ground foraging in open grasslands



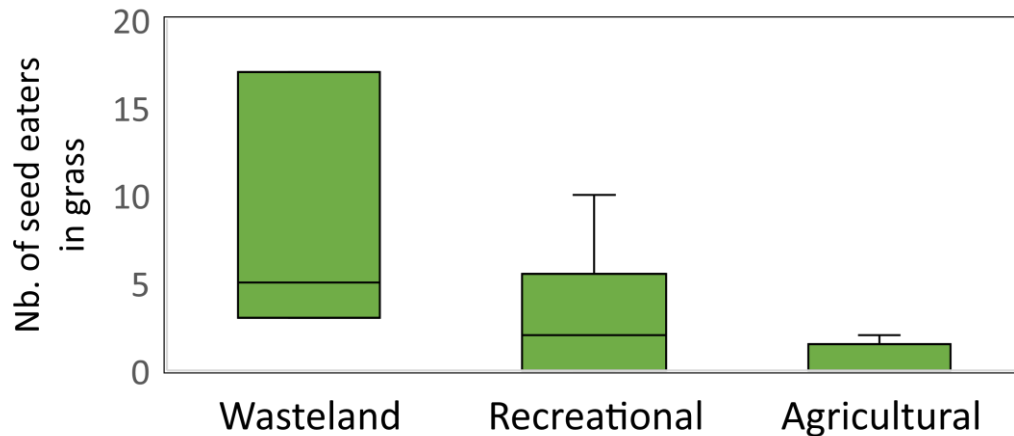
Less ground foraging in grasslands situated in wooded landscapes



Results (N.B. model with 21 sites only)

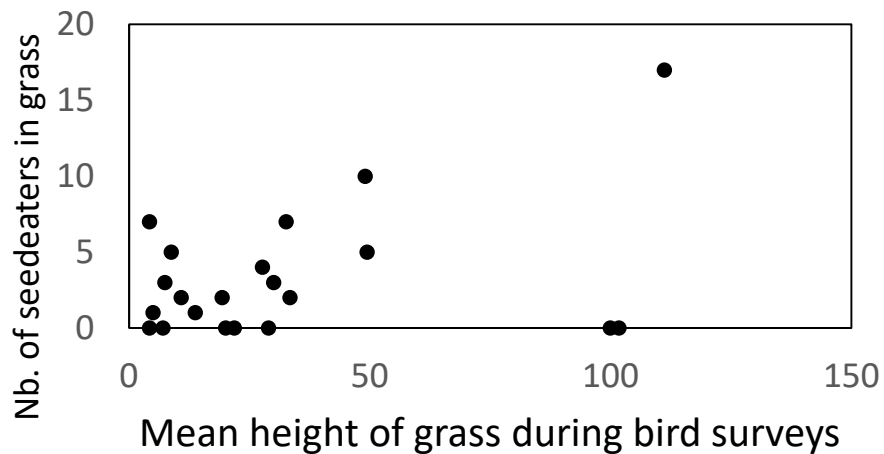
Ground foraging by seedeaters and insectivores

Seed eaters more abundant in wastelands

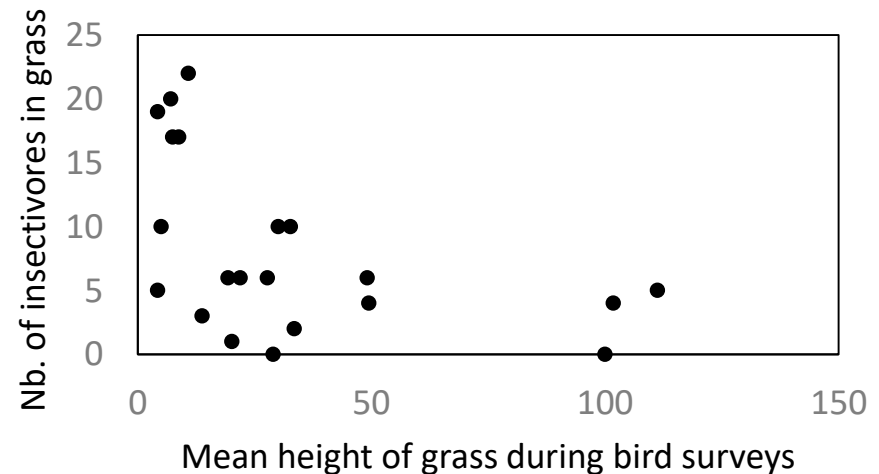


Which species are involved ? An initial look at seed-eaters and insectivores shows opposite responses to grass height. Seedeaters prefer longer grass **and wastelands**

Abundance of seedeaters increases with mean height of grass



Abundance of insectivores decreases with mean height of grass



Discussion

Diverse feeding and nesting opportunities for birds in urban grasslands and wastelands

- Urban wastelands in our study were less numerous, but more species rich than recreational grasslands in the same contexts
- Wastelands had similar mean grass heights to agricultural sites but more seedeaters were observed feeding in them than in rural grasslands
- However recreational sites were more utilised for ground foraging by species requiring visible invertebrate prey, which also preferred more open (less wooded) landscapes



Conclusion

Perspectives, implications for management

- Wastelands in our study areas very short-lived – should we see active management to maintain less « organised » and less disturbed grass/scrub?
- Scrub and trees within grasslands increase habitat heterogeneity and species richness but open areas of short-mown grass are of interest for insectivorous feeding
- Private gardens provide complementary resources and can boost bird abundance in nearby urban green spaces





Thank you for your attention

and to Pascal Bellion, Marie Jagaille, Vincent Oury, Cindy Schrader and Frédéric Vaidie for fieldwork and laboratory assistance.

Project financed by Conseil Régional des Pays de la Loire (URBIO: Biodiversity of Urban Areas), and Angers Loire Métropole (post-doctoral grant)

Contact : j.pithon@groupe-esa.com

