Room for rent:

How habitat and materials influence the use of insect nesting boxes

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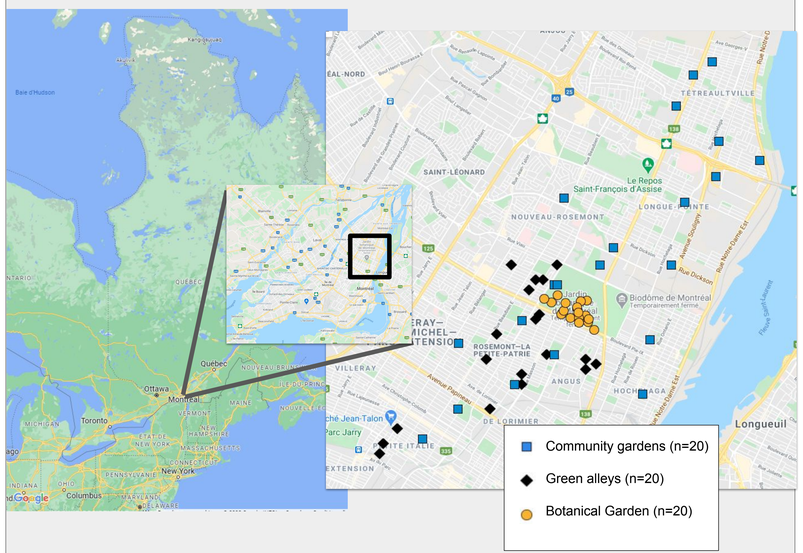
Introduction

- Insect nesting boxes (=bee houses, insect hotels) are marketed as a way to support pollinator populations by providing additional nesting habitats, especially in urban contexts, but their actual impacts remain controversial.
- Concerns have been raised about the use of insect nesting boxes, including enabling introduced species to thrive (Geslin et al. 2020) and increasing parasitism, predation and pathogen prevalence in native species (MacIvor and Salehi 2014; Groulx and Forrest 2017).
- We compare the use of nesting boxes by bees and wasps between habitats, substrate and cavity diameter.

Study area



Materials

Material / Cavity diameter	Log	Reed
Narrow (3-5 mm)		
Mixed		
Wide (5-8 mm)		

Methods

Results

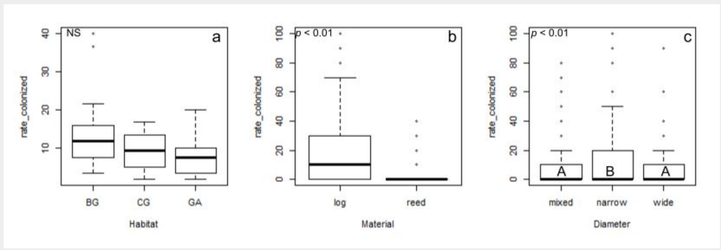


Fig 1. Colonization rate (%) between (a) habitats, (a) materials, and (c) cavity diameter. Letters in (c) indicate Tukey HSD *post hoc* test results. BG=Botanical Garden, CG=Community gardens, GA=Green alleys.

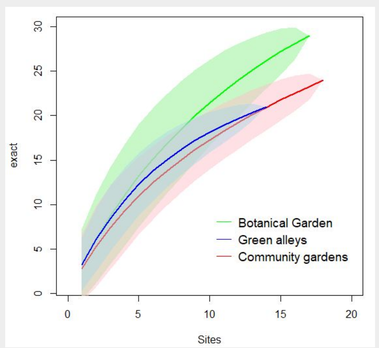


Fig 2. Species accumulation curves for each habitat.

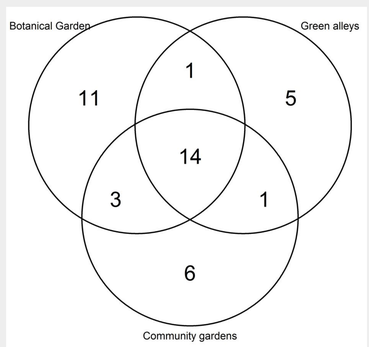


Fig 3. Venn diagram showing species richness between habitats.

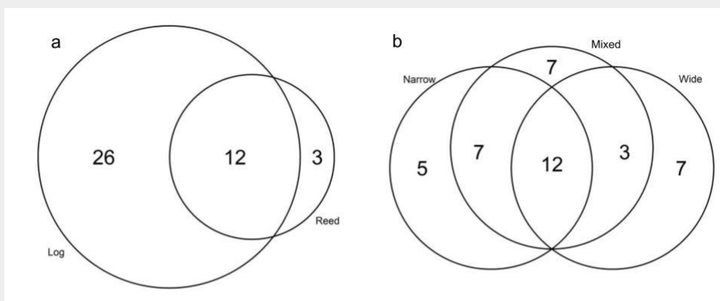
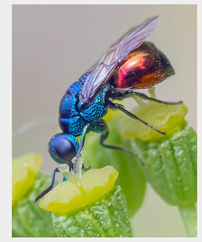


Fig. 6. Venn diagram showing species richness between (a) material and (b) cavity diameter.

Table 1. List of taxa collected from nesting boxes during emergence. Taxa in bold are not native to the study area. Guild: KL=kleptoparasite, PA=parasitoid, PO=pollinator, PR=predator. Numbers indicate abundance. BG=Botanical Garden, CG=Community gardens, GA=Green alleys.

Family	Genus	Species	Guild	BG	CG	GA
Braconidae		sp.	PA			1
Chrysididae	*Caenochrysis*	***sayi***	KL	1		
	Pseudomalus	***auratus***	KL	7	4	4
		janus	KL	1	6	4
Colletidae	*Hylaeus*	***communis***	PO	4	27	
		modestus	PO			11
Crabronidae	*Nitela*	*cerasicola*	PR	2		
	Trypoxylon	*collinum*	PR			1
		figulus	PR	62	3	1
		carinatum	PR	1		
	Crabronidae	sp.	PR	1		
Eulophidae	*Kocourekia*	sp.	PA		5	
		debilis	PA		4	
	Melittobia	***acasta***	PA	60	4	6
	Eulophidae	sp1	PA	2	1	12
	Eulophinae	sp2	PA	6	6	10
Figitidae	Figitidae	sp.	PA	4		
Ichneumonidae	*Ephialtes*	sp.	PA			2
	Perithous	***scurra***	PA		3	16
Megachilidae	*Anthidium*	***florentinum***	PO		1	
	Chelostoma	***rapunculi***	PO	4	7	2
	Coelioxys	*moesta*	KL	4		
	Heriades	*carinata*	PO	2	5	16
	Megachile	*campanulae*	PO		3	
		centuncularis	PO	10		
		mendica	PO	5		28
		relativa	PO	28	6	13
	Osmia	*atriventris*	PO	3	1	
Pemphredonidae	*Passaloecus*	***eremita***	PR	28	10	7
		gracilis	PR	11	32	10
	Psenulus	***pallipes***	PR	5	30	22
	Spilomena	***troglodytes***	PR	9		
Pompilidae	*Dipogon*	sp.	PR		2	
Platygastroidea		sp.	PA	5		
Pteromalidae	*Dibrachys*	sp.	PA	1	22	
	Pteromalidae	sp.	PA	9		
	Pteromalinae	sp.	PA	4		
Sapygidae	*Sapyga*	*louisi*	KL			8
Sphecidae	*Isodontia*	*mexicana*	PR	1	7	3
Vespidae	*Ancistrocerus*	*antilope*	PR		3	
	Symmorphus	*canadensis*	PR	7	2	1



Pseudomalus auratus (Diane Özdamar)

Symmorphus sp. (Sonya Charest)

Megachile sp. (Diane Özdamar)

Discussion

Nesting boxes are used by several native species, which were more diverse but less abundant than introduced species. While they are marketed as habitats for pollinators, they are also used by predators and parasites. Most predators found in our study were aphid wasps that likely act as biocontrol agents in gardens, but their impact could be mitigated by spider-hunting wasps.

Acknowledgements

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Literature

Geslin et al. (2020) Bee hotels host a high abundance of exotic bees in an urban context. Acta Oecol 105:103556.

Groulx & Forrest (2018) Nesting aggregation as a predictor of brood parasitism in mason bees (Osmia spp.). Ecol Entomol 43:182-191.

MacIvor & Salehi (2014) Bee species-specific nesting material attracts a generalist parasitoid: Implications for co-occurring bees in nest box enhancements. Environ Entomol 43:1027-1033.