A modest study on biodiversity in Hartford community gardens

Premise: Urban gardens will be hotspots of biodiversity in an otherwise degraded urban landscape.

Because Hartford has an extensive set of diverse community gardening sites, and because my CTP partner Lucia was keen on an insect project, we initiated a study, looking at ant and arthropod diversity in the city.

Why ↑diversity in gardens?

- ↑ Plant diversity – crops, weeds
- ↑ Structural diversity – e.g., corn, vining plants, trellis
- ↑ Moisture variability with extensive irrigation
- ↑ Pollinators attracted to long season of blooms
- ↑ Plant and woody debris

Typical small garden


SO 250
nm f/4.5-5.6 IS STM)
Large garden - Knox
Rasta

Large Garden
Earle Street

Sampling scheme

Sampled ants 3 dates
- 3 large gardens (>5000 m^2)
- 3 small gardens (<600 m^2)

Sampled for ants+arthropods 1 date
- 3 matched “controls” (old field)
- 3 matched “controls” (turf)

Units: Six 40 dram pitfalls per site per date.

Analysis: Ant species identified for garden sites on 3 dates. Arthropod (morphospecies + ants) identified for garden sites and controls on Aug 24.

Quick look at the sample sites

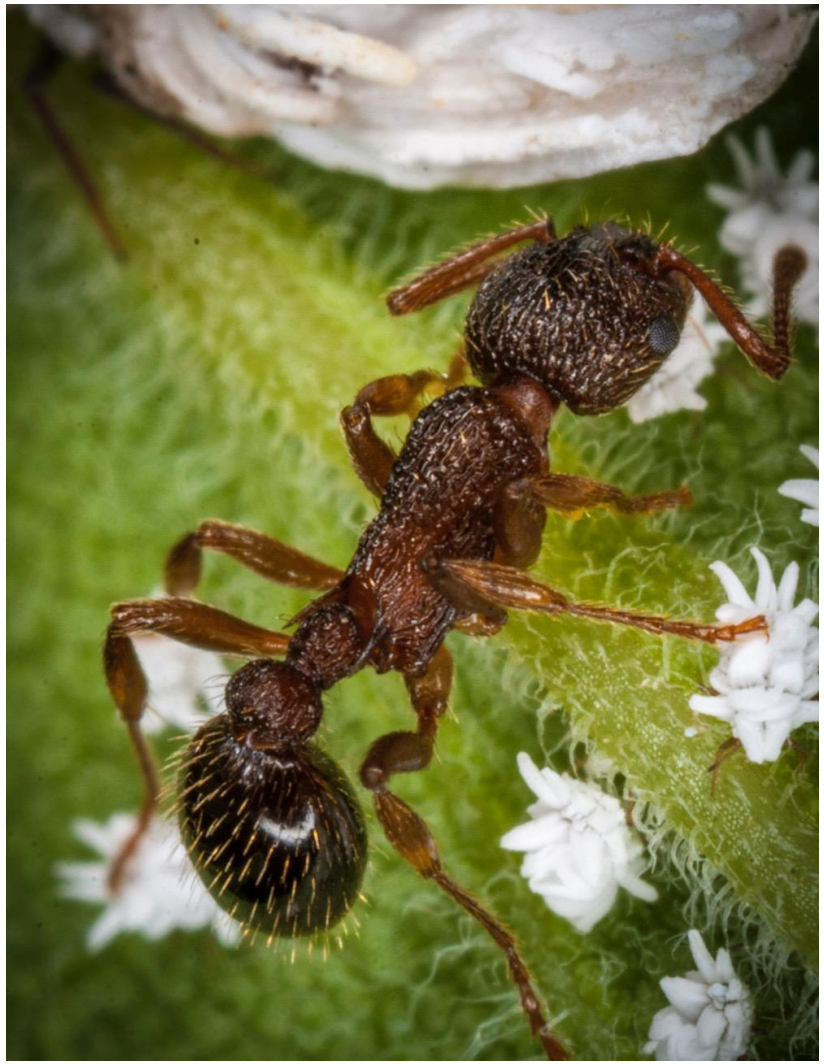
Community Garden
Biodiversity Study

The ants

ca. 20 species

Large and small gardens with similar species counts

Common species



Myrmica nr rubra

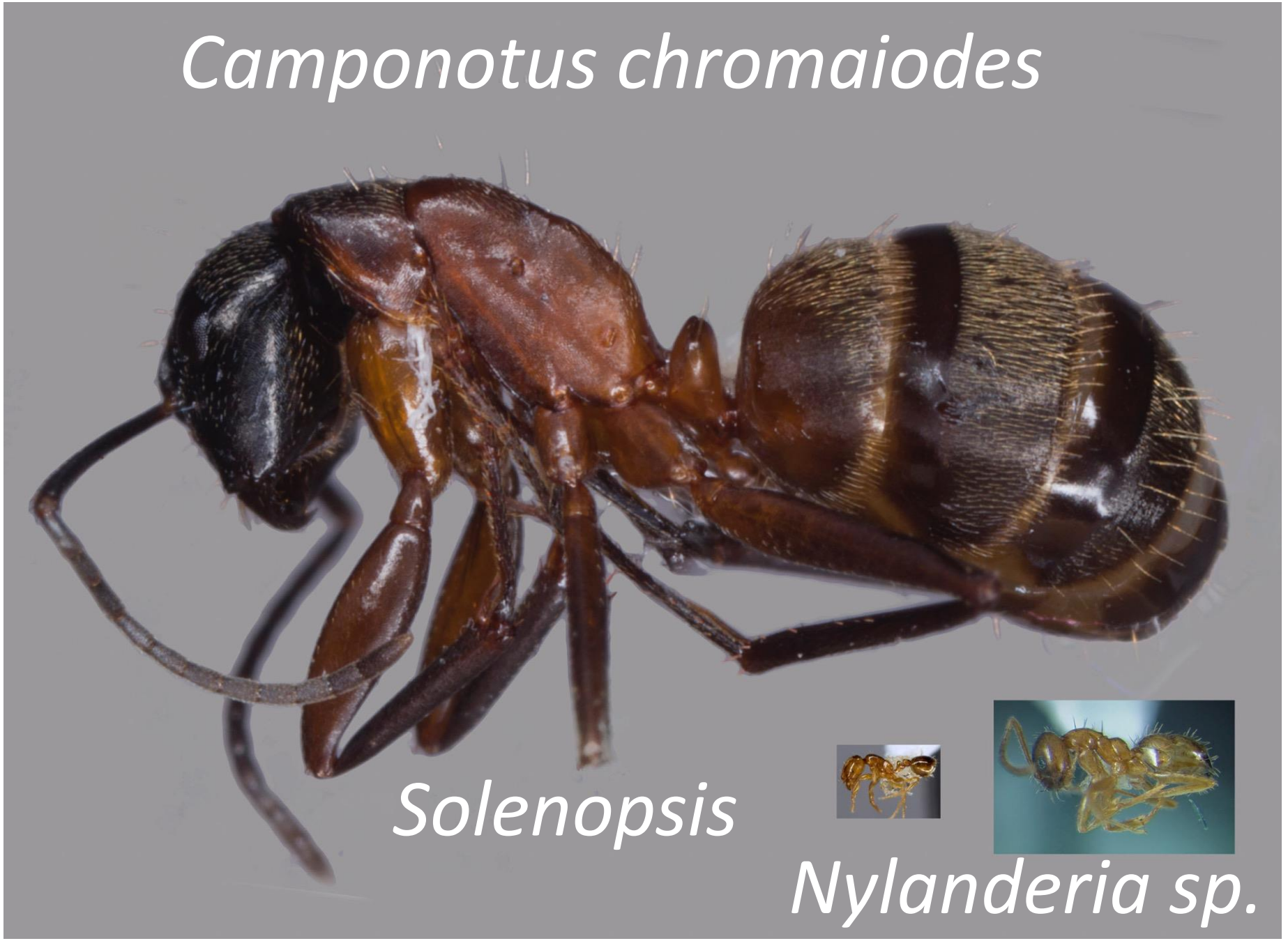
Premolepis imparis

“Rare”

Formica incerta

Crematogaster cerasi

Extremes



Species	**WATKINS**	**HQRS**	BROAD	SARGEANT	HUNTINGT	**EARLE**	WATK ctrl	HQRS ctrl	BROAD ctrl	SARG ctrl	HUNT ctrl	EARLE ctrl
Tapinoma sessile	X	**X**		X								
Brachymyrmex	X	X										
Camponotus chromaiodes												
Camponotus nearcticus				x								
Camponotus Pennsylvanicus	X		x	X								
Formica incerta						X						
Formica neogagates												
Formica subsericea	X			X		X						
Lasius claviger	X			X								
Lasius neoniger	X	X	X	X	X	X	X	x	x	x		

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Nylanderia parvula				X		X						
Prenolepis imparis	X	X	X	X	X	X		x	x		x	x
Apheanogaster fulva	X											
Crematogaster cerasi				X								
Myrmica rubra	X			X	X	X	X			x		
Myrmica americana								X				x
Solenopsis molesta	X	X	X	X		X	X	x		x	x	x
Tetramorium immigrans	X	X	X	X	X	X	X	x	x		x	
Ponera pennsylvanica					X				x			
Species Count	11	6	5	12	5	8	4	5	4	3	3	3

Manhattan Study

- High stress medians:
  21 species (!)

- Urban forests
  32 species

Savage, A. M., Hackett, B., Guénard, B., Youngsteadt, E. K., Dunn, R. R. (2014), "Fine-scale heterogeneity across Manhattan's urban habitat mosaic is associated with variation in ant composition and richness." *Insect Conservation and Diversity*.

Camponotus herculeanus

Camponotus novaeboracensis

We expect the same difference here.
2 species observed in Keney Park, and absent from all other urban sites.

Manhattan study says:

“High-stress areas had much less diversity than lower stress areas”

But 21 species in medians? Impressive.

With more data … what would we see in Hartford,

Gardens – Forest – Medians ?

The arthropod comparison

H: more species in gardens than in controls.

Large gardens more diverse than small.

Aug 24: Garden sites	Total items	Morpho Species	Ant Species
Broad	40	16	4
Huntington	53	14	4
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EARLE	44	13	4
KNOX	41	22	4
WATKINS	47	27	7

More species in large gardens than small?

Evidence is weak. Large: 21 species; small: 15 species

Site	Total items	Species	ants
Broad	40	16	4
--Ctrl	57	13	4
Huntington	53	14	4
--Ctrl	32	11	3
Sargeant	51	25	6
--Ctrl	33	13	3
EARLE	44	13	4
--Ctrl	51	16	3
KNOX	41	22	4
--Ctrl	43	17	4
WATKINS	47	27	7
--Ctrl	92	34	5

More species in gardens than in urban background controls?

No

Gardens: 19.5 species
Controls: 17.3 species

Just in case you wondered … total items by group

Site	Ant	Coleoptera	Diptera	Hemiptera	Iso/centi/milli	Orthoptera	Snail	Spider/Opilio	Wasp	Grand Total
Broad	18	2	3	12				4	1	40
Earle	21	4	1	6	10			2		44
Hunt	40	4		3	3	1		2		53
Knox	21	4	3	4				7	2	41
Sarg	15	13	7	5	1	1		8	1	51
Watkins	17	8	3		10	1	2	6		47
Broad Ctrl	44	3	1	4	3		1	1		57
Erle Ctrl	9	1	3	2	13	11	5	3	4	51
Hunt Ctrl	23	5	1		1		1	1		32
Knox-ctrl	11	11	2		15	1	1	2		43
Sarg Ctrl	23	5						5		33
Watkins CTRL	38	6	4	20	5		6	6	7	92

Summary

(Disclaimer: n = 6 sites, and sample size = 6 traps)

Ants are way cool. Having established the IDs for many of the typical urban Hartford species, we are in a good position to ask further interesting questions.

Summary

Gardens do not appear to be hotspots of diversity in the urban landscape. Given the initial rationale (habitats available, vegetative and structural complexity, etc), Why?

- limitations of pitfalls
- degree of disturbance

I would love to do the Garden – Background – Forest follow-up

Formica neogagates

Glastonbury

Site		Total items	Species	ants
Broad	GARDEN SITES	40	16	4
EARLE		44	13	4
Huntington		53	14	4
KNOX		41	22	4
Sarg		51	25	6
WATKINS		47	27	7
Broad Ctrl	CONTROL SITES	57	13	4
EARLE Ctrl		51	16	3
Hunt Ctrl		32	11	3
KNOX ctrl		43	17	4
Sarg Ctrl		33	13	3
WATK CTRL		92	34	5

More species in gardens than in controls?

No

Large gardens more diverse than small?

No