Harmonia axyridis in Brussels : faunistical and ecological observations

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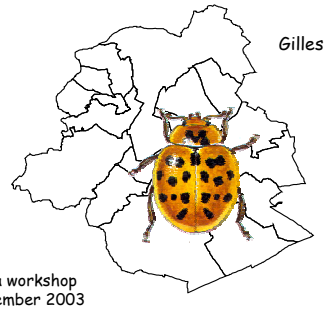


Harmonia workshop
27th November 2003

I. Introduction

Initial aim of my work :
What's the impact of urbanisation on ladybirds in Brussels ?

Here :
results concerning *Harmonia axyridis* only

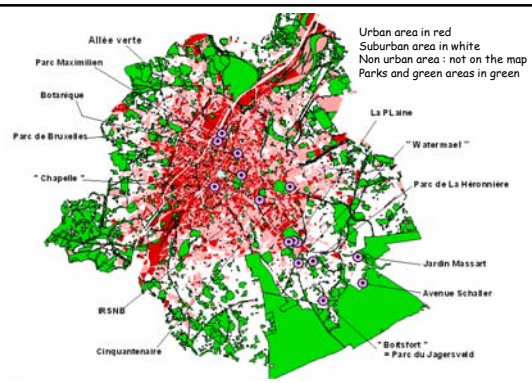
II. Structure

- Method used
- Absolute abundance along the urban-rural gradient and relative abundance
- Discussion
- Interactions among ladybirds communities on pine tree
- Discussion
- Future Prospects

III. Method

Ladybirds cached on 3 tree species : Pine (*Pinus nigra*)
Lime (*Tilia X vulgaris*)
Maple (*Acer pseudoplatanus*)

9 sites selected for each tree species along an urban-rural gradient
Transect divided in 3 areas with 3 sites for each area:
urban area (3sites)
suburban area (3sites)
non urban area (3sites)



Urban area in red
Suburban area in white
Non urban area : not on the map
Parks and green areas in green

Urban area = less than 50% of the surface covered by vegetation
Sub urban area = more than 50% of the surface covered by vegetation

III. Method

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Each site visited 4 times (mid April, May, beginning of June, end of June)

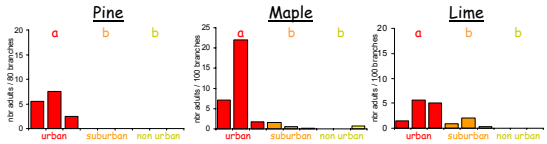
Ladybirds cached with a beating method
Beating tray = butterfly net (diameter : 65 cm)

Pine tree : 80 branches beaten (by groups of 10 or 20 beats)
Deciduous trees : 100 branches beaten (by groups of 10 or 20 beats)

Aphids visually counted: deciduous trees : nbr aphids/cm² leaf
pine tree : nbr aphids/cm branch

IV. Results and discussion

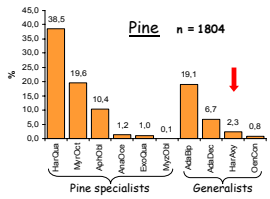
Absolute abundance



→ *Harmonia axyridis* is significantly more abundant on the urban sites

On pine tree, *H.axyridis* is completely absent from non urban and suburban areas

Relative abundance



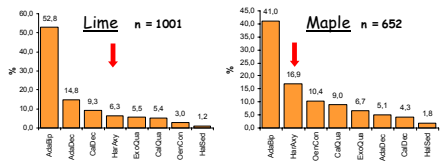
Harmonia axyridis is the 6th species on pine

Larvae observed --> reproduction possible on this tree

H.axyridis is more abundant than some native pine specialists

Relative abundance

deciduous trees



H.axyridis :

4th species on lime
2nd species on maple

only 1 year after the beginning of his expansion

Why is *H.axyridis* so much abundant in the city ?

First hypotheses : Brussels = centre of infestation

Higher human population density --> higher introduction probability

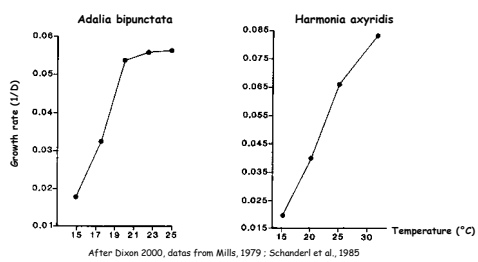
Second hypotheses : urban conditions are favourable for *H.axyridis*

As *Adalia bipunctata*, *H.axyridis* is a typical urban exploiter:

- ubiquist (food and habitat)
- high fecundity
- high growth rate
- very competitive (intraguild predation)

Two urban condition should be particularly favourable :

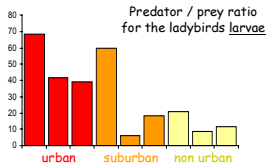
- High prey densities
- Higher temperature



Adalia bipunctata : growth rate maximal from 20°C
Harmonia axyridis : growth rate increases linearly from 15° to 30°

→ *H.axyridis* particularly favoured by high temperatures ?

Interactions on pine tree



Predator / prey ratios greater in urban conditions for the ladybirds larvae

→ competition for food probably greater on the urban sites

Abundance: number of larvae / 80 branches

	Adalia	BisQua	BisAxy	Adverse	TOTAL
Urban 1	**93,7**	43,42	18,28	**88**	243,43
Urban 2	**502**	104	12	**618**	1236
Urban 3	**102**	28	2	**328**	460
Suburban 1	0	0	0	0	0
Suburban 2	0	0	0	**21**	21
Suburban 3	0	0	0	**33,1**	33,14
Non urban 1	0	0	0	0	0
Non urban 2	0	0	0	1	1
Non urban 3	0	0	0	0	0

Mid April

Urban 1	14	**93**	**65**	1	173
Urban 2	17,77	**99,55**	**64**	0	181,33
Urban 3	30	**50**	**69**	20	150
Suburban 1	0	7	3	**15**	25
Suburban 2	14,85	**26,28**	0	0	49,14
Suburban 3	10,28	11,42	0	0	27,42
Non urban 1	0	2	0	10	15
Non urban 2	1	0	0	2	3
Non urban 3	0	2	0	3	5

Beginning of June

Urban 1	**2**	**2**	1	0	5
Urban 2	0	**2**	0	0	2
Urban 3	0	**2**	0	0	2
Suburban 1	0	**8**	0	2	11
Suburban 2	0	0	0	9	9
Suburban 3	0	**14**	0	0	15
Non urban 1	0	**4**	0	0	10
Non urban 2	0	**11**	0	5	17
Non urban 3	0	**8**	0	2	12

End of June

What's happening ?

Urban sites (Pine trees):

higher predator/prey ratios --> higher competition

precocity of ladybirds population

Adalia larvae dominant in mid April

Harmonia larvae dominant at the beginning of June

How can we explain the dominance change ?

Interpretation difficult (more precise data's should be necessary)

Hypotheses 1

Adalia's could lay their eggs earlier and grow more rapidly --> in this case, adults would emerge earlier

Hypotheses 2

Adalia's decrease could be explained by Intraguild Predation and canibalism (cf high predator/prey ratios - cf Louis Hautier's results)

But then, why *H.4-punctata* seems not to be affected by I.P. ?
Maybe its dorsal spines protect this species against I.P, as it is the case for *H.axyridis*

Laying his eggs later could be a strategy for *Harmonia axyridis :*
Larvae and eggs of more precocious species could be used as food for intraguild predators

V. Future prospects

1°) Intraguild Predation relations among
Adalia - H.axyridis - H.4-punctata

2°) Evolution of the abundance of *Harmonia axyridis* in relation with the abundance of native species

we have a good method (cheap, easy, rapid, … but not perfect)
we have a first set of data's

Is such a survey interesting ? Or are the American works sufficient ?
Who can do it and how ?

This has to be discussed …