THE OCCURRENCE OF MULTICOLORED LADYBIRD, *HARMONIA AXYRIDIS* PALLAS, A BIOLOGICAL CONTROL AGENT, IN AGRO-ECOSYSTEMS IN WALLONIA

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Introduction/context :Who is *H. axyridis*?

- Multicoloured ladybird : *Harmonia axyridis* Pallas

Coccinellidae, Coleoptera

used as Biocontrol agent BUT

- Intraguild predation (IGP) Decrease of natives aphidophagous (Coccinellids, hoverflies, lacewings)
- Damages to fruit crops in late summer
- Aggregates in building (overwintering sites)

Study about the impact of the invasion on the agro-ecosystems

SPW
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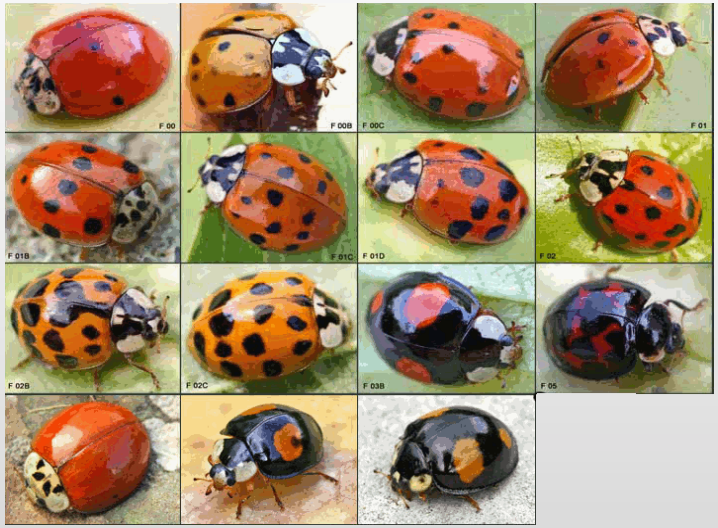
WHO IS *H. AXYRIDIS*?

- Asian lady beetle, Japanese lady beetle, multicoloured lady beetle, harlequin ladybird
- Size: 4,9-8,2 mm (*A. bipunctata*: 4 - 5 mm, *C. septempunctata*: 5,5 – 8 mm)
- 200 morphotypes : red, orange, yellow, black, 0-19 spots
- 3 morphotypes in Belgium
  - Succinea (70%): red with black spots
  - Spectabilis (20%): black with 4 red spots
  - Conspicua (5%) : black with 2 red spots



WHO IS *H. AXYRIDIS*?

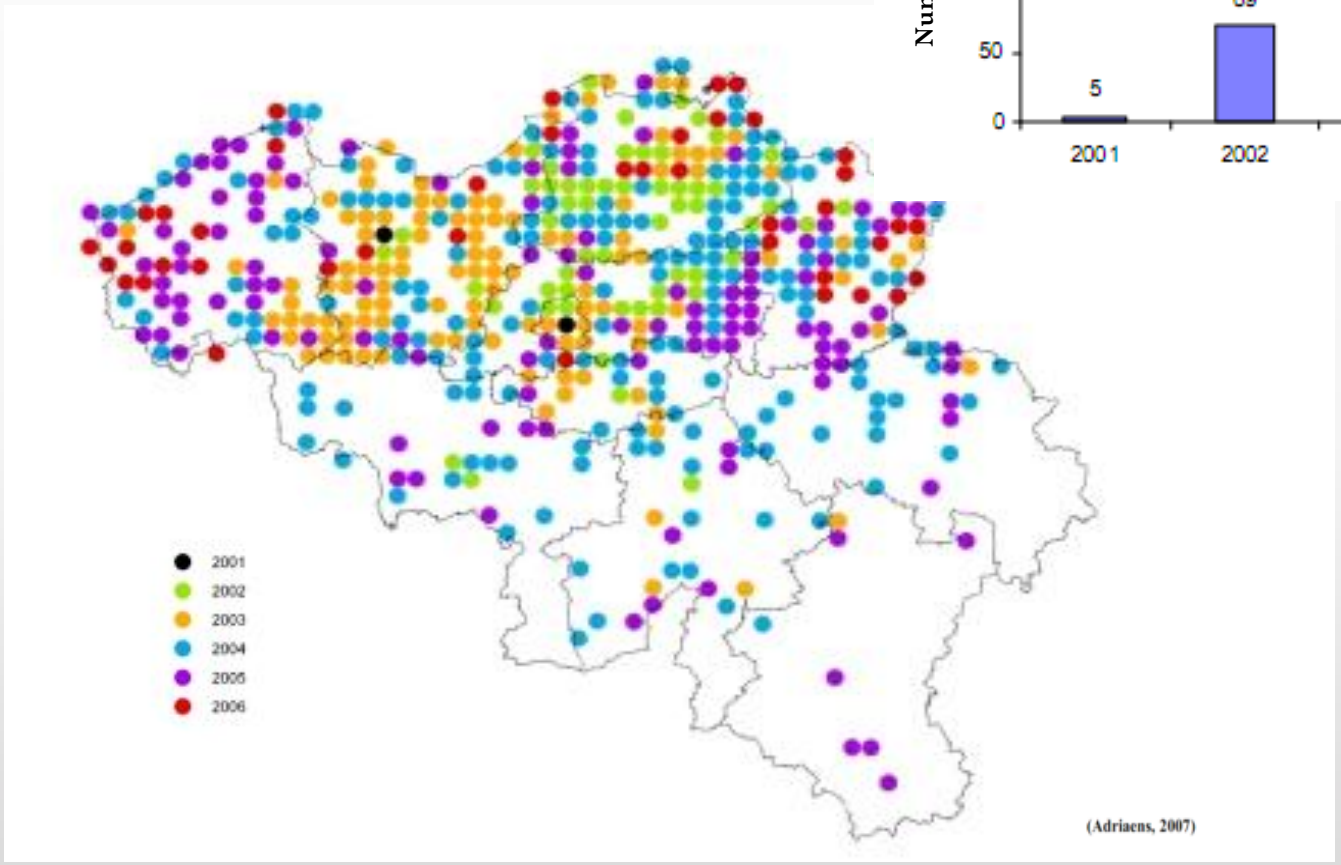
- Origine: south-east of Asia

Great climatologic area

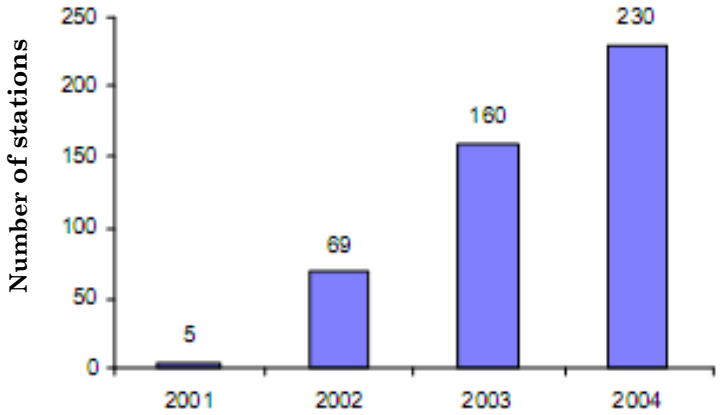
Invasion & expansion are easy and quick

HISTORY OF INVASION

- Introduction of *Harmonia axyridis* in 1997 for the biological control of aphids



Number of stations where *H. axyridis* was found in Belgium



Data: Coccinula

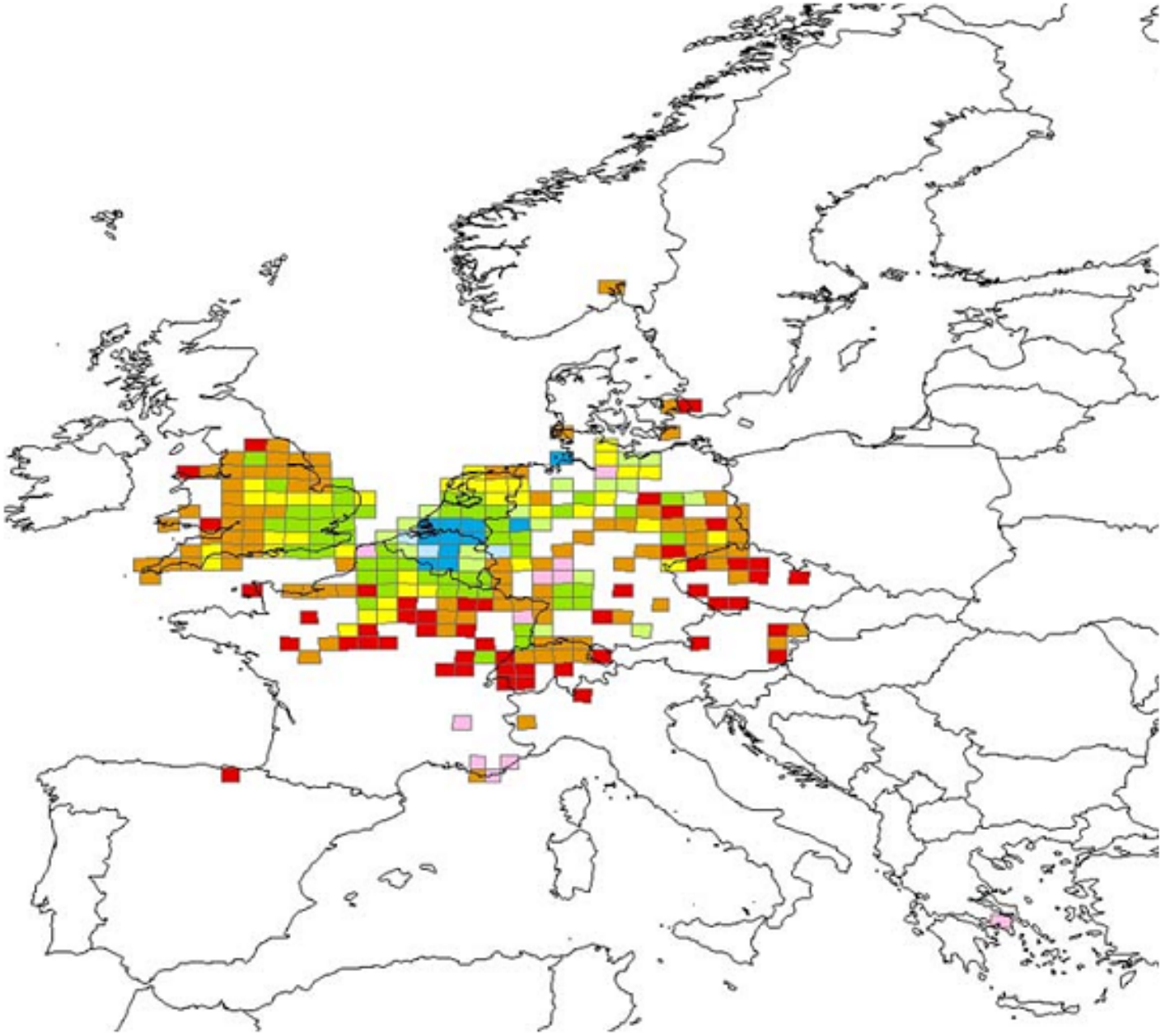


Fig. 1 Recorded occurrence of *H. axyridis* in 50 km^2 in Europe. (Year of first known record: red = 2007; orange = 2006; yellow = 2005; dark green = 2004; pale green = 2003; dark blue = 2002; pale blue = 2001; pink = pre 2001)

(Brown, 2008)

Negative impacts

- Intraguild predation (IGP) Decreasing of native aphidophagous (Coccinellids, hoverflies, lacewings)


- Damages to fruit crops in late summer



- Aggregates in buildings (overwintering sites)



Objectives of the study

Evaluation of the impacts of the *H. axyridis* invasion on the crops ecosystems

Determination of…

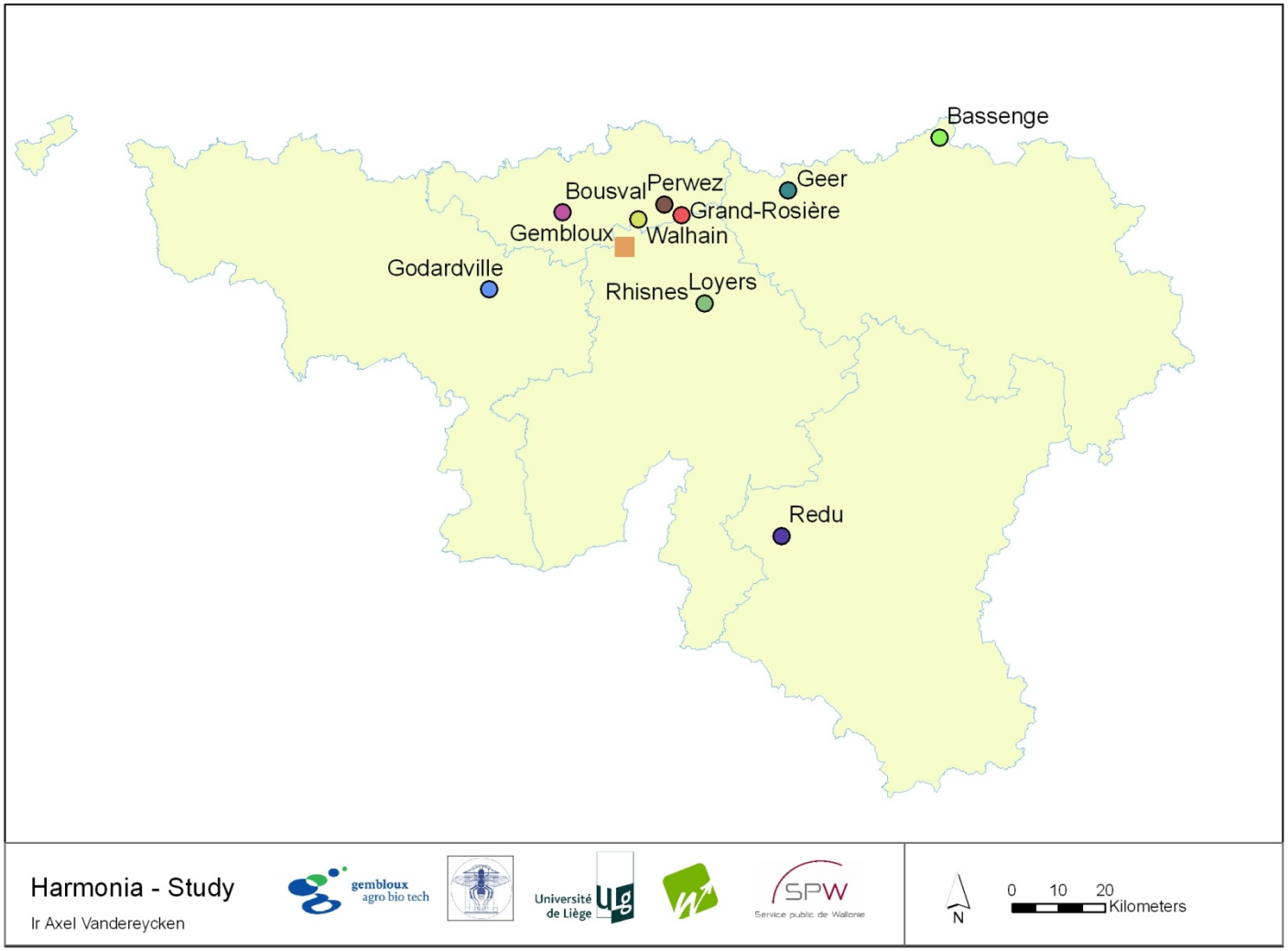
the agro-habitats of the *H. axyridis*

the impact on the other aphid predators

the impacts on aphid populations

MATERIAL AND METHODS

- 10 sites in Wallonia



Sampling methods

Sticky trap: Bug-Scan
(continuous observation 15 days)

1/Field

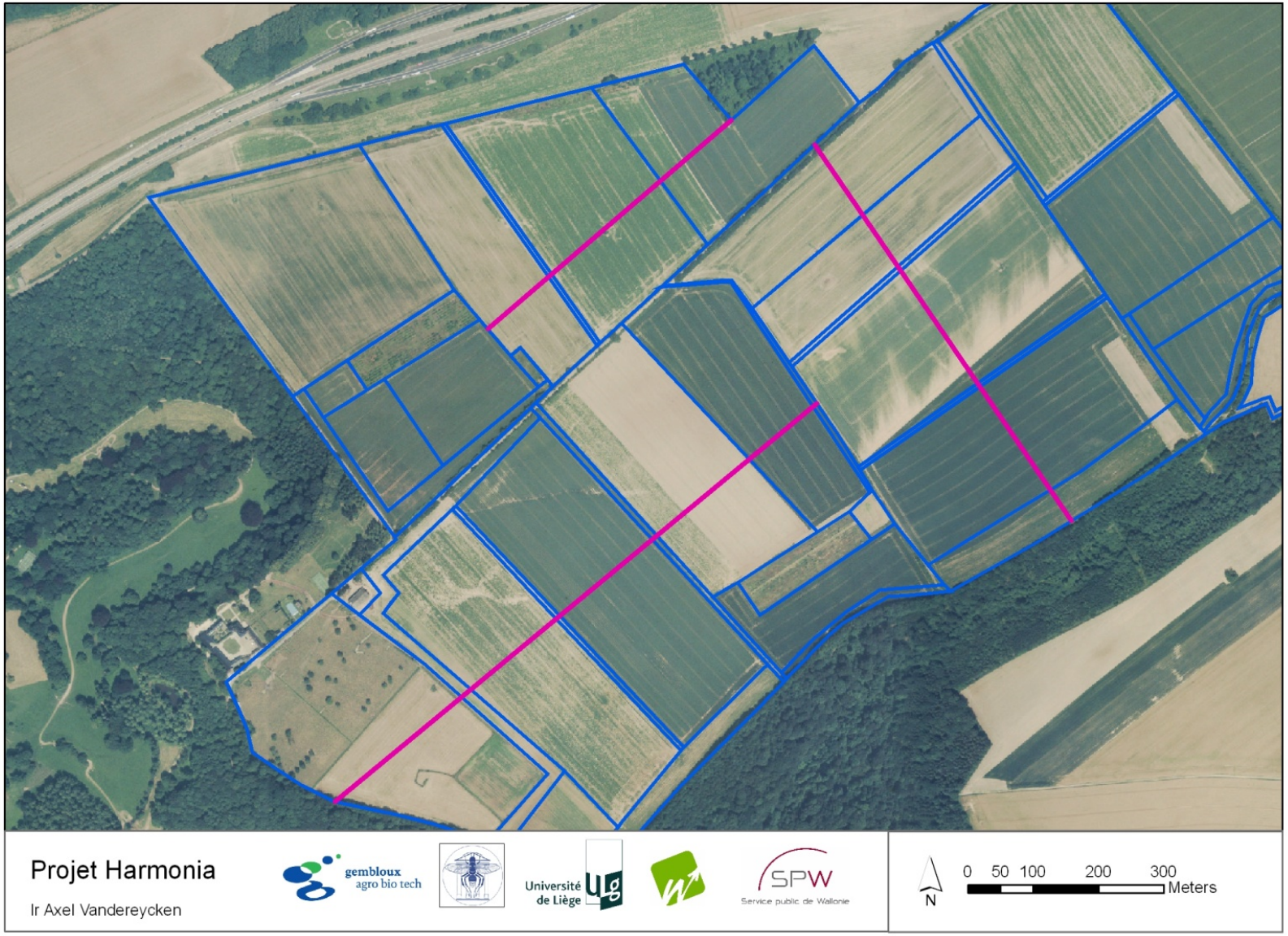
Quadras
(ponctual observation)

The number on each field
is function of the field size

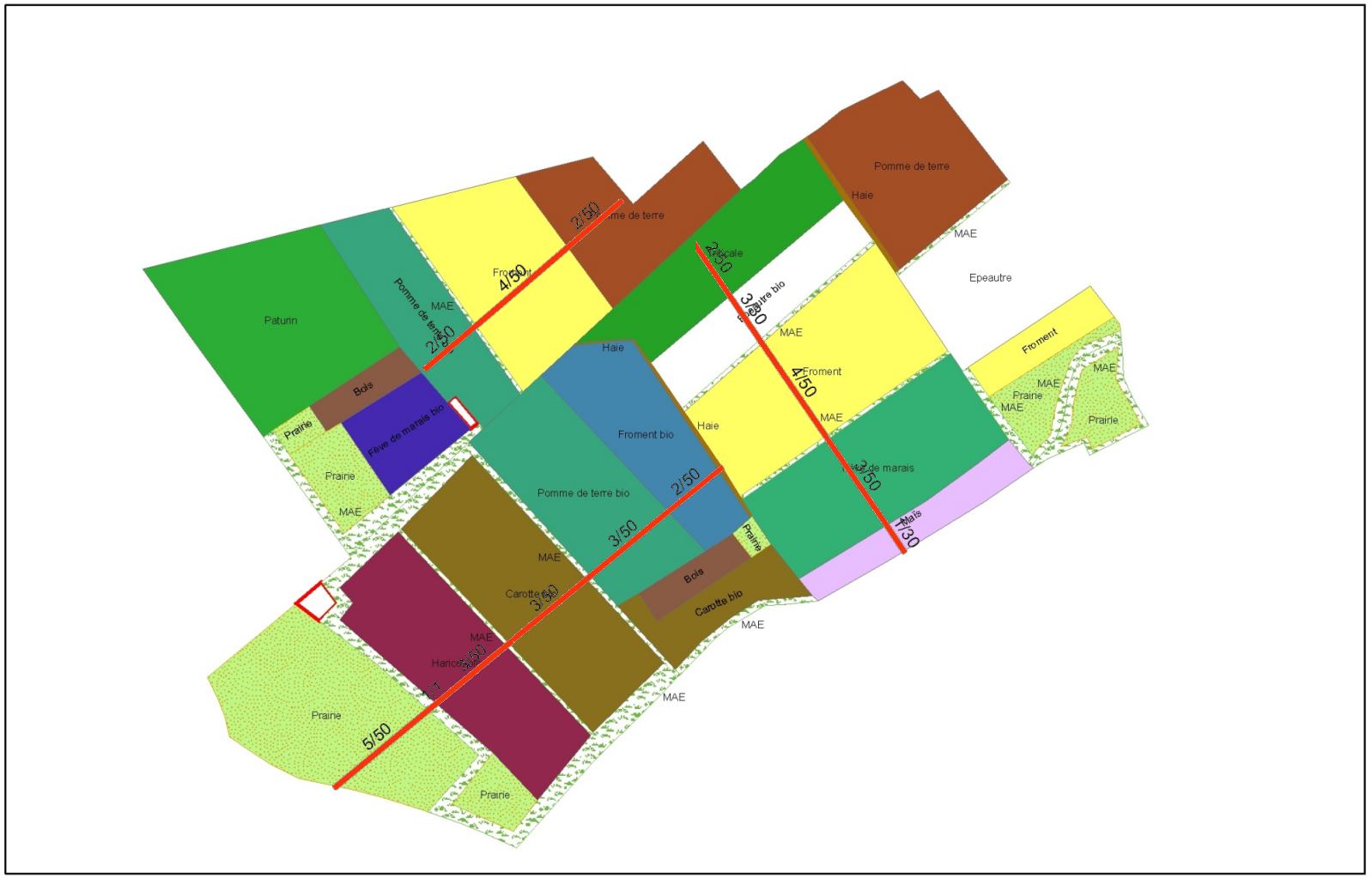
MATERIAL AND METHODS

- Cartography of the crop exploitation

MATERIAL AND METHODS



MATERIAL AND METHODS



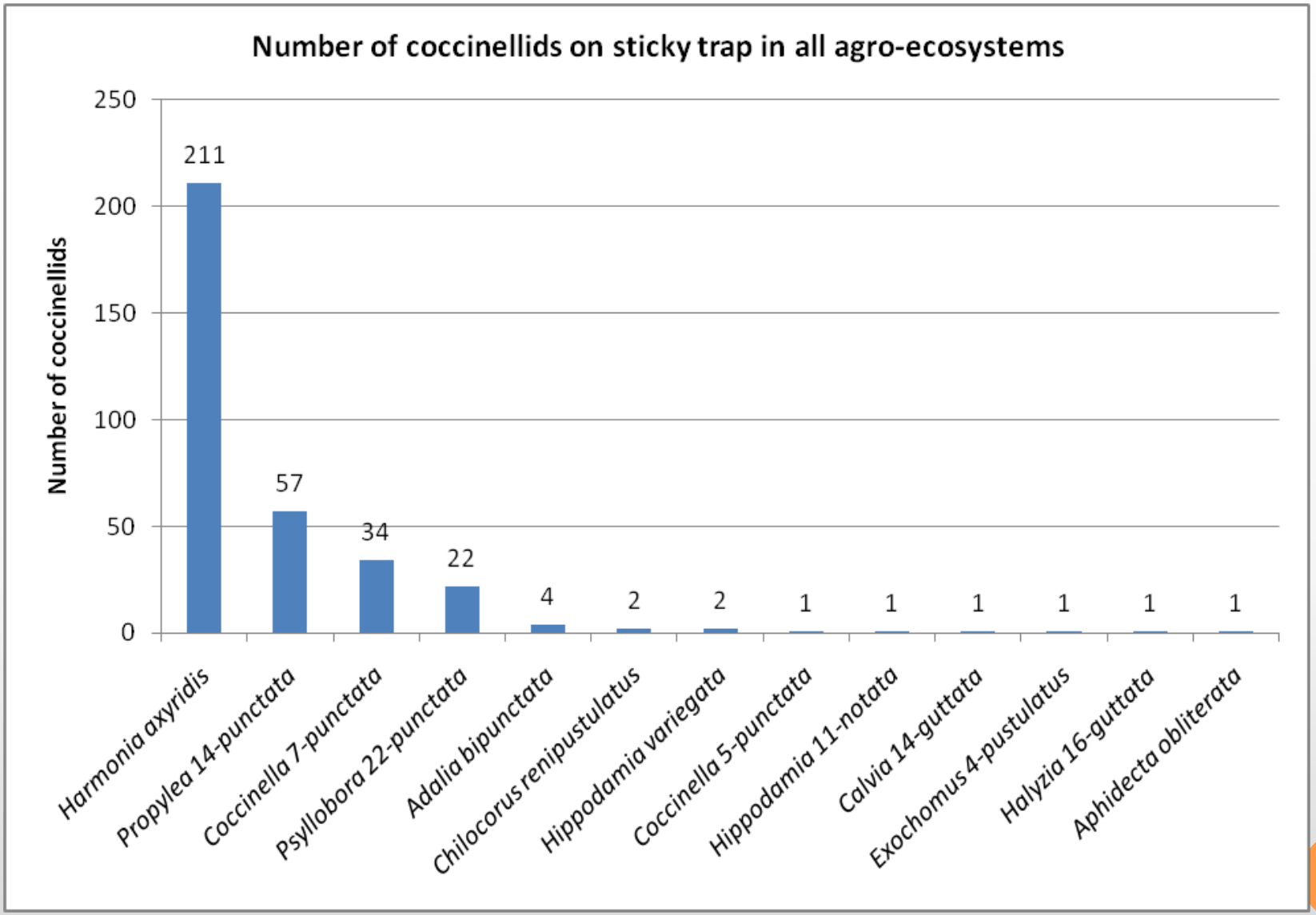
Results: insects







Results


Number of coccinellids on sticky trap in all agro-ecosystems
Number of coccinellids
250
200
150
100
50
0
211
57
34
22
4
2
2
1
1
1
1
1
1
Harmonia axyridis
Propylea 14-punctata
Coccinella 7-punctata
Psyllobora 22-punctata
Adalia bipunctata
Chilocorus renipustulatus
Hippodamia variegata
Coccinella 5-punctata
Hippodamia 11-notata
Calvia 14-guttata
Exochomus 4-pustulatus
Halyzia 16-guttata
Aphidecta obliterata

Results

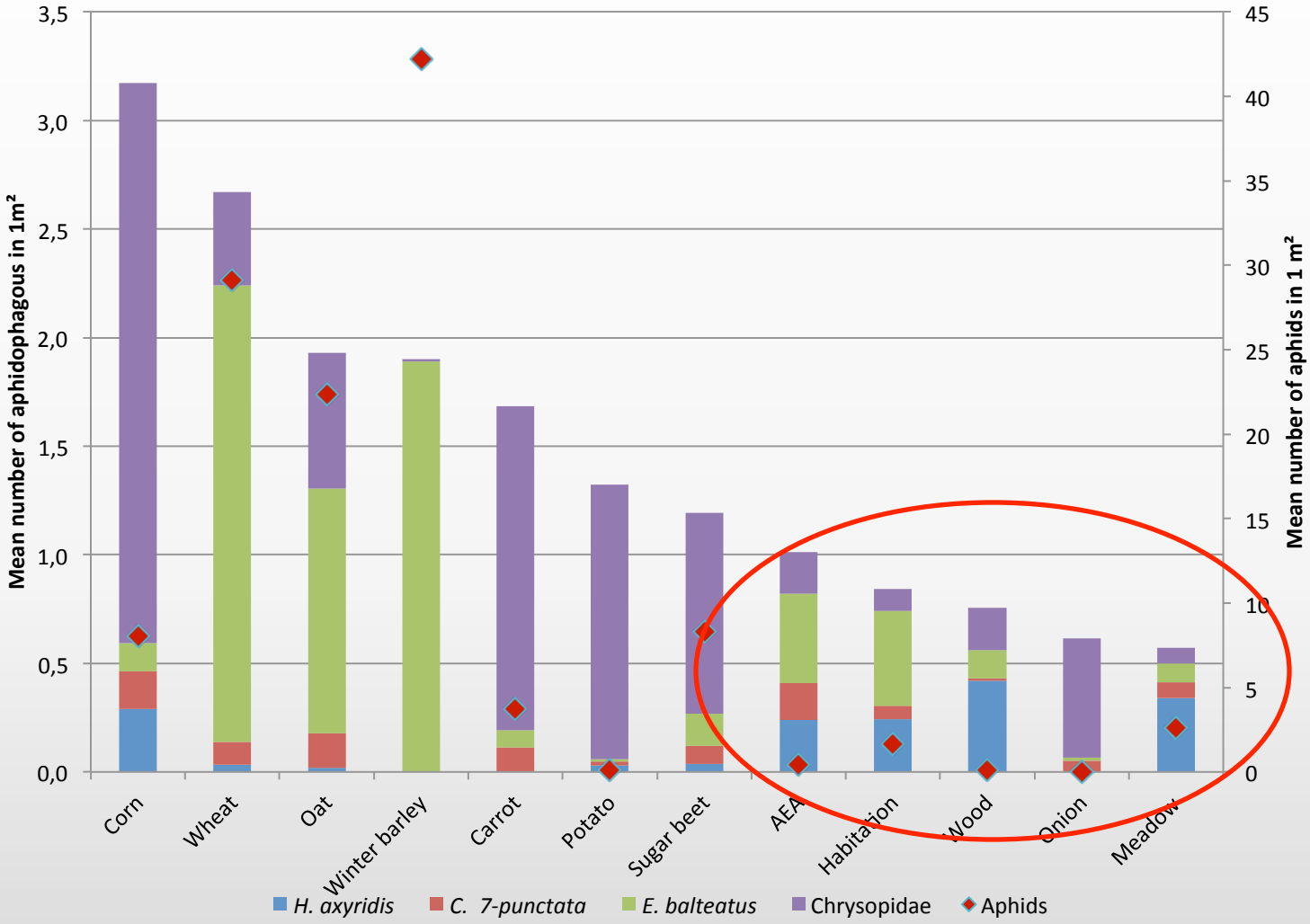
- 9 species of hoverfly

Episyrphus balteatus
Melanostoma mellinum
Parasyrphus macularis
Eristalis arbustorum
Eristalis tenax
Scaeva pyrastri
Metasyrphus latifasciatus
Sphaerophoria rueppelli
Sphaerophoria menthastri

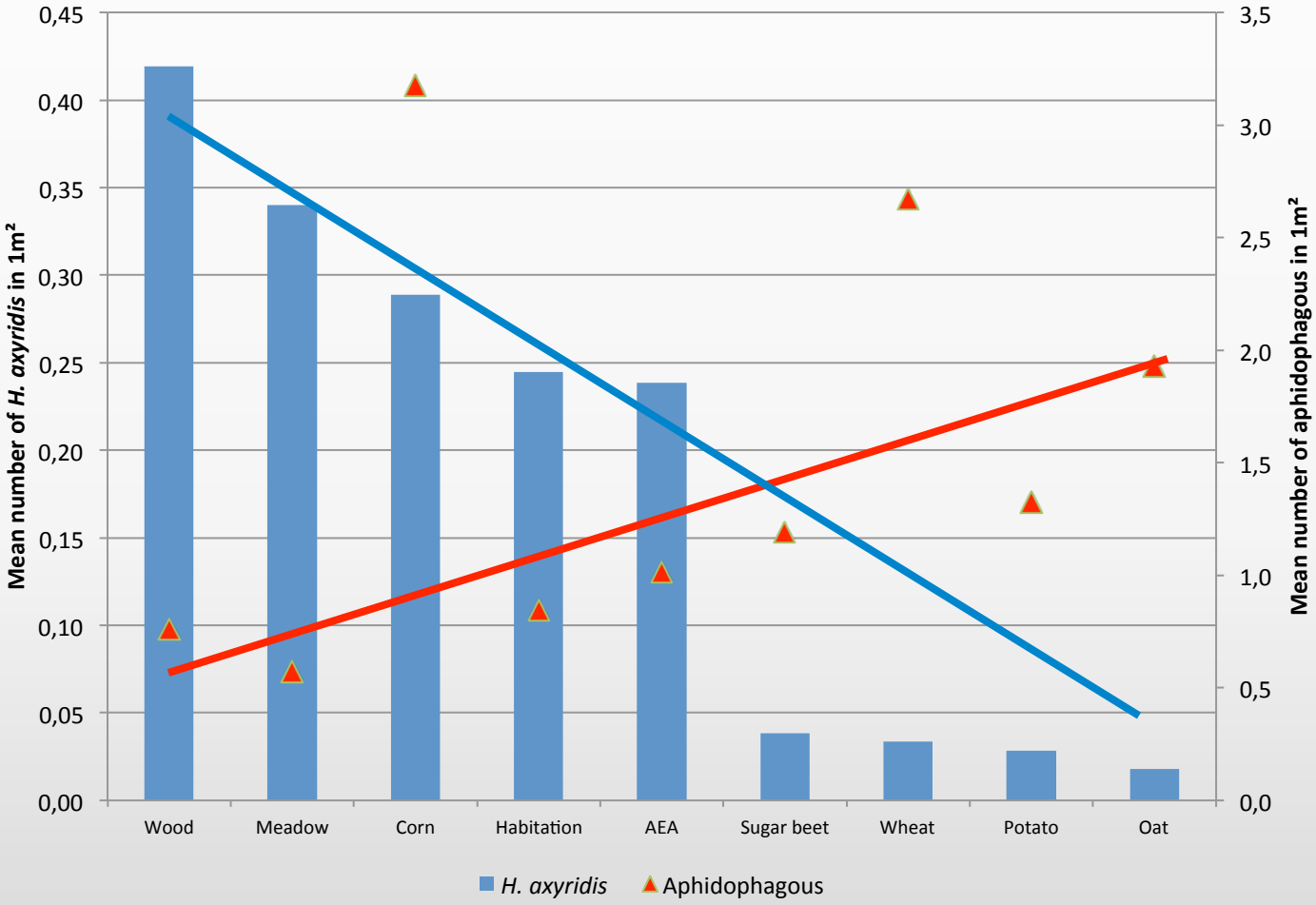
- 12 species of aphid

Sitobion avenae
Sitobion fragariae
Metopolophium dirhodum
Aphis fabae
Megoura viciae
Acyrthosyphon pisum
Rhopalosiphum padi
Rhopalosiphum maidis
Nasonovia ribisnigri
Cavariella aegopodii
Macrosiphum euphorbiae
Uroleucon sonchi

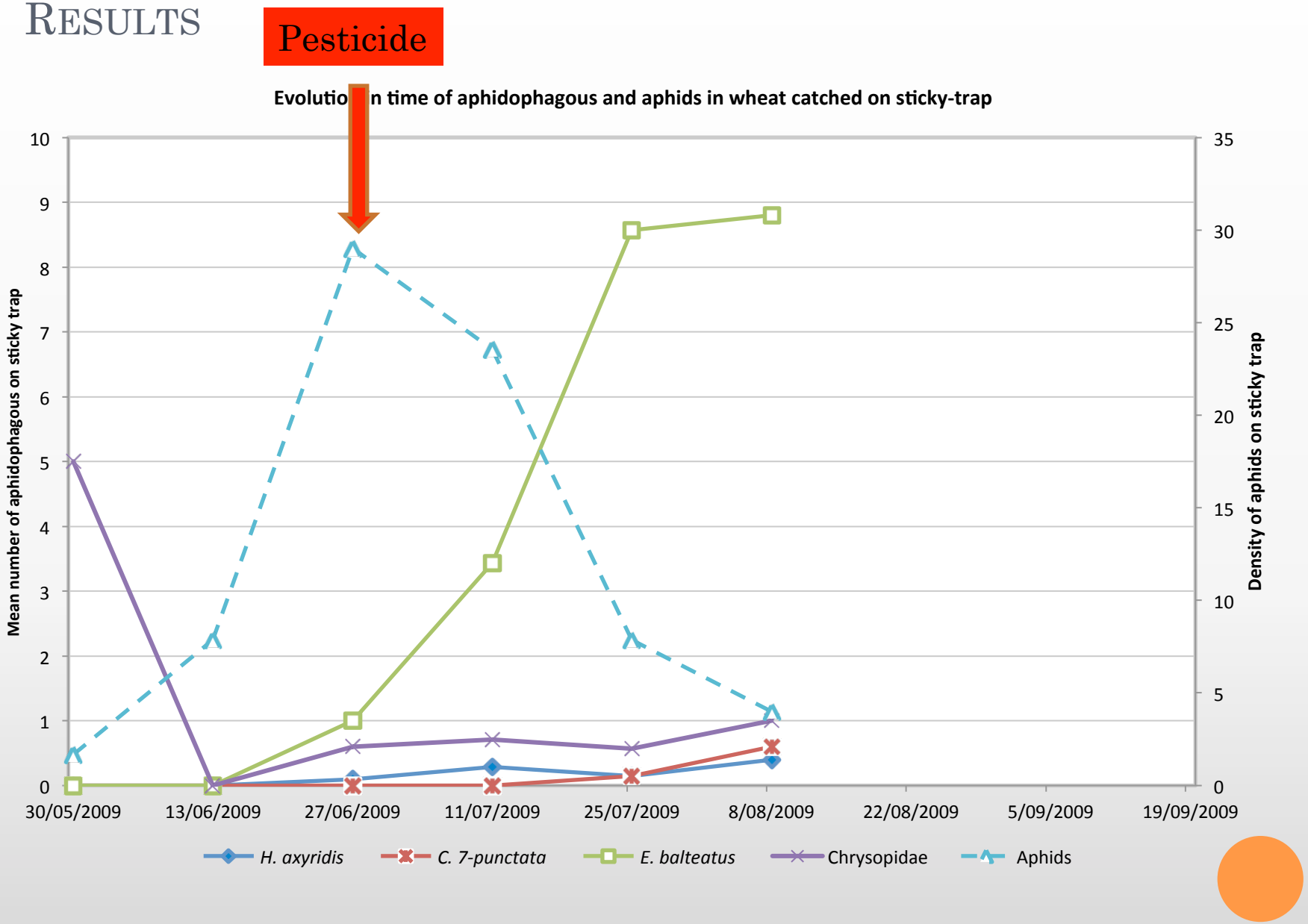
Results


Mean number of aphidophagous in 1m²
Mean number of aphids in 1 m²
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
45
40
35
30
25
20
15
10
5
0
Corn
Wheat
Oat
Winter barley
Carrot
Potato
Sugar beet
AEA
Habitation
Wood
Onion
Meadow
H. axyridis
C. 7-punctata
E. balteatus
Chrysopidae
Aphids

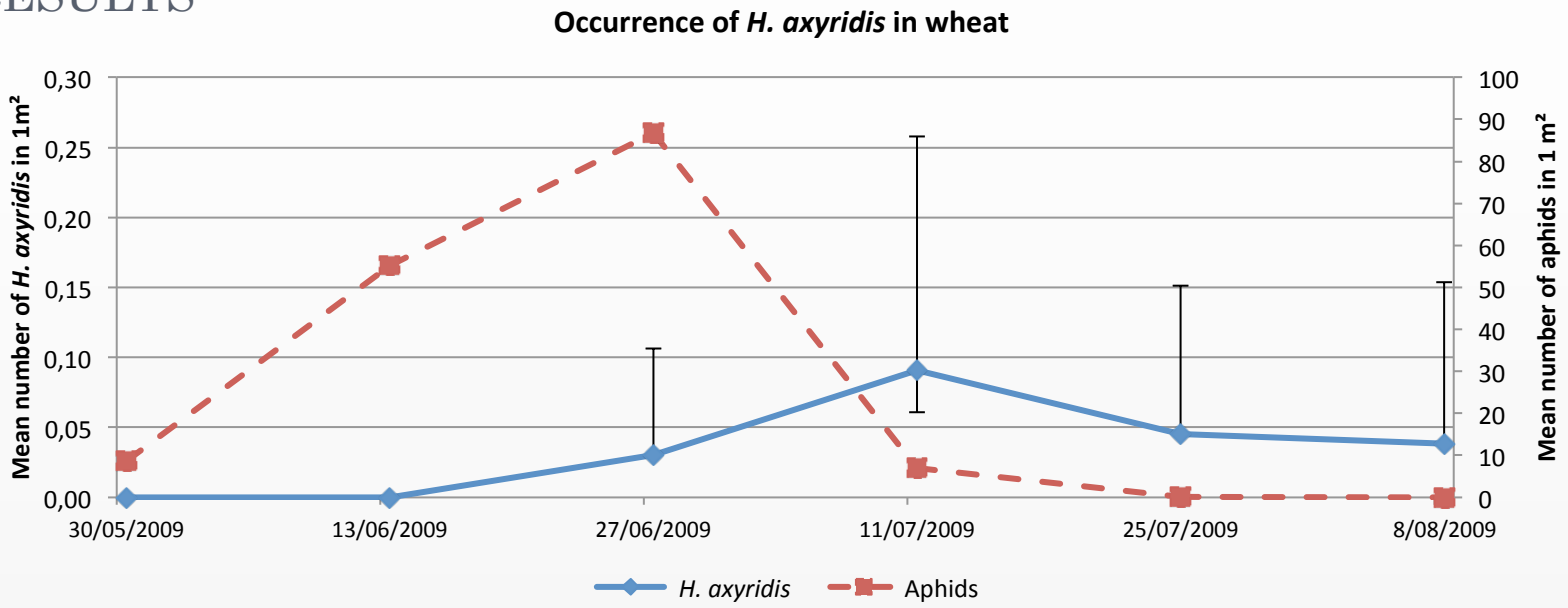
Results

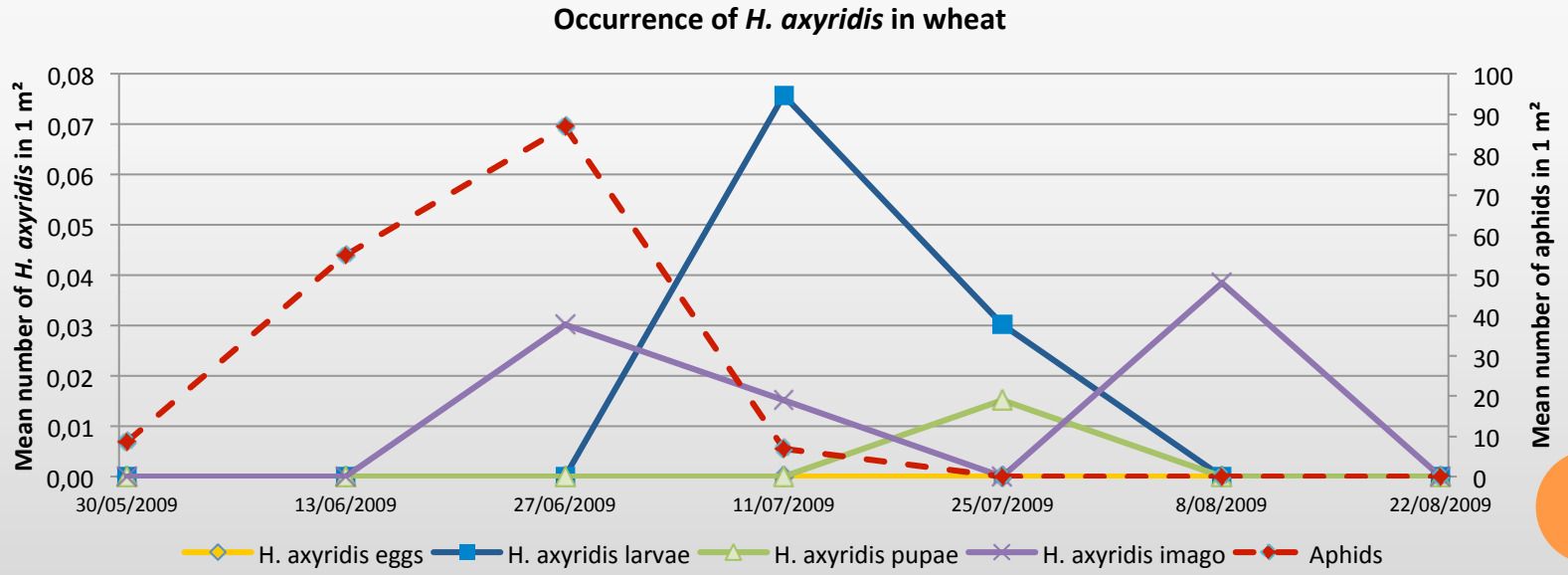

0,45
0,40
0,35
0,30
0,25
0,20
0,15
0,10
0,05
0,00
Mean number of H. axyridis in 1m²
3,5
3,0
2,5
2,0
1,5
1,0
0,5
0,0
Mean number of aphidophagous in 1m²
Wood
Meadow
Corn
Habitation
AEA
Sugar beet
Wheat
Potato
Oat
H. axyridis
Aphidophagous

RESULTS


Pesticide
Evolution in time of aphidophagous and aphids in wheat catched on sticky-trap
Mean number of aphidophagous on sticky trap
Density of aphids on sticky trap
0
1
2
3
4
5
6
7
8
9
10
0
5
10
15
20
25
30
35
30/05/2009
13/06/2009
27/06/2009
11/07/2009
25/07/2009
8/08/2009
22/08/2009
5/09/2009
19/09/2009
H. axyridis
C. 7-punctata
E. balteatus
Chrysopidae
Aphids

Results

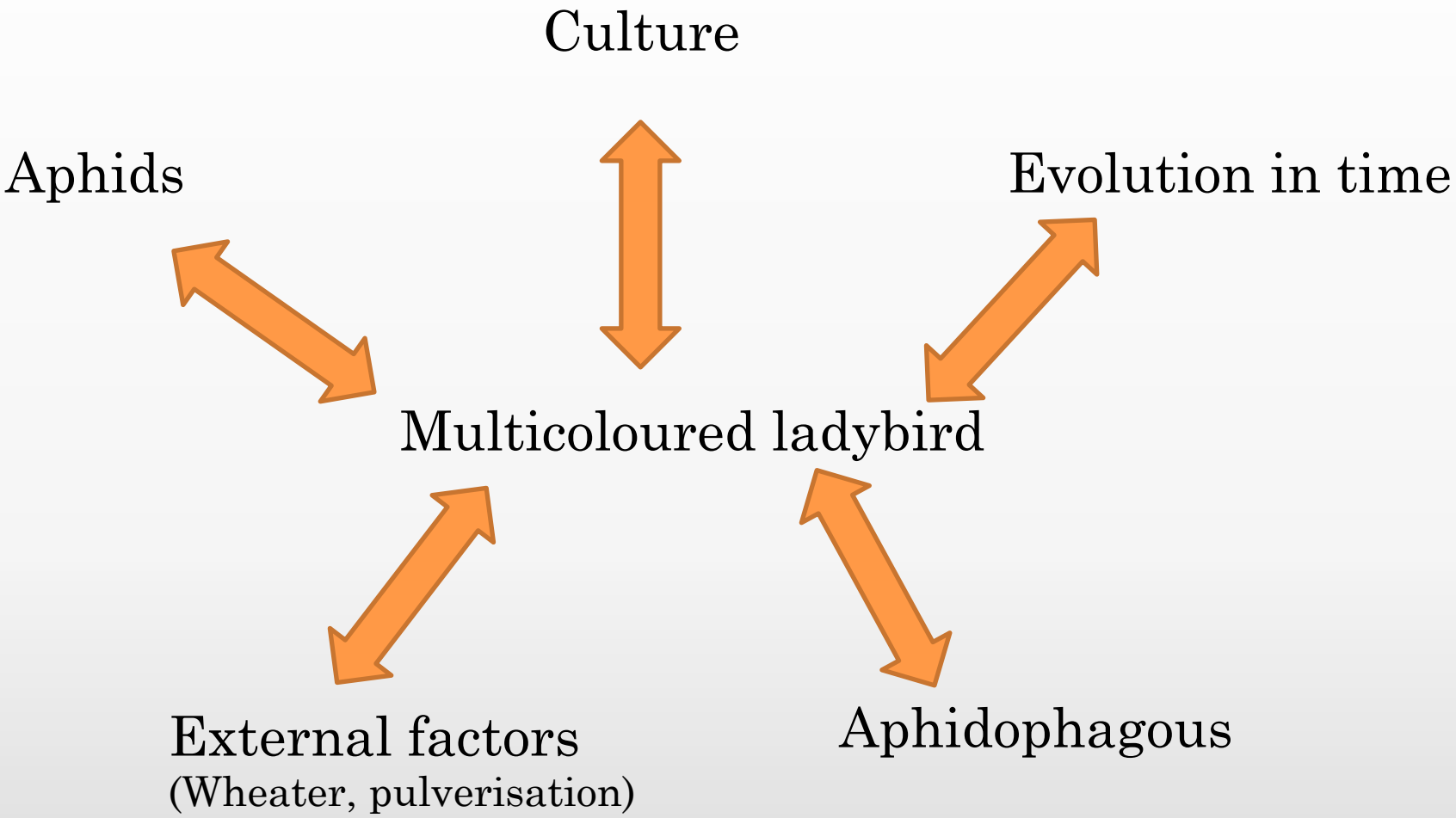

Occurrence of H. axyridis in wheat
Mean number of H. axyridis in 1m²
Mean number of aphids in 1 m²
0,30
0,25
0,20
0,15
0,10
0,05
0,00
100
90
80
70
60
50
40
30
20
10
0
30/05/2009
13/06/2009
27/06/2009
11/07/2009
25/07/2009
8/08/2009
H. axyridis
Aphids


Occurrence of H. axyridis in wheat
Mean number of H. axyridis in 1 m²
Mean number of aphids in 1 m²
0,08
0,07
0,06
0,05
0,04
0,03
0,02
0,01
0,00
100
90
80
70
60
50
40
30
20
10
0
30/05/2009
13/06/2009
27/06/2009
11/07/2009
25/07/2009
8/08/2009
22/08/2009
H. axyridis eggs
H. axyridis larvae
H. axyridis pupae
H. axyridis imago
Aphids

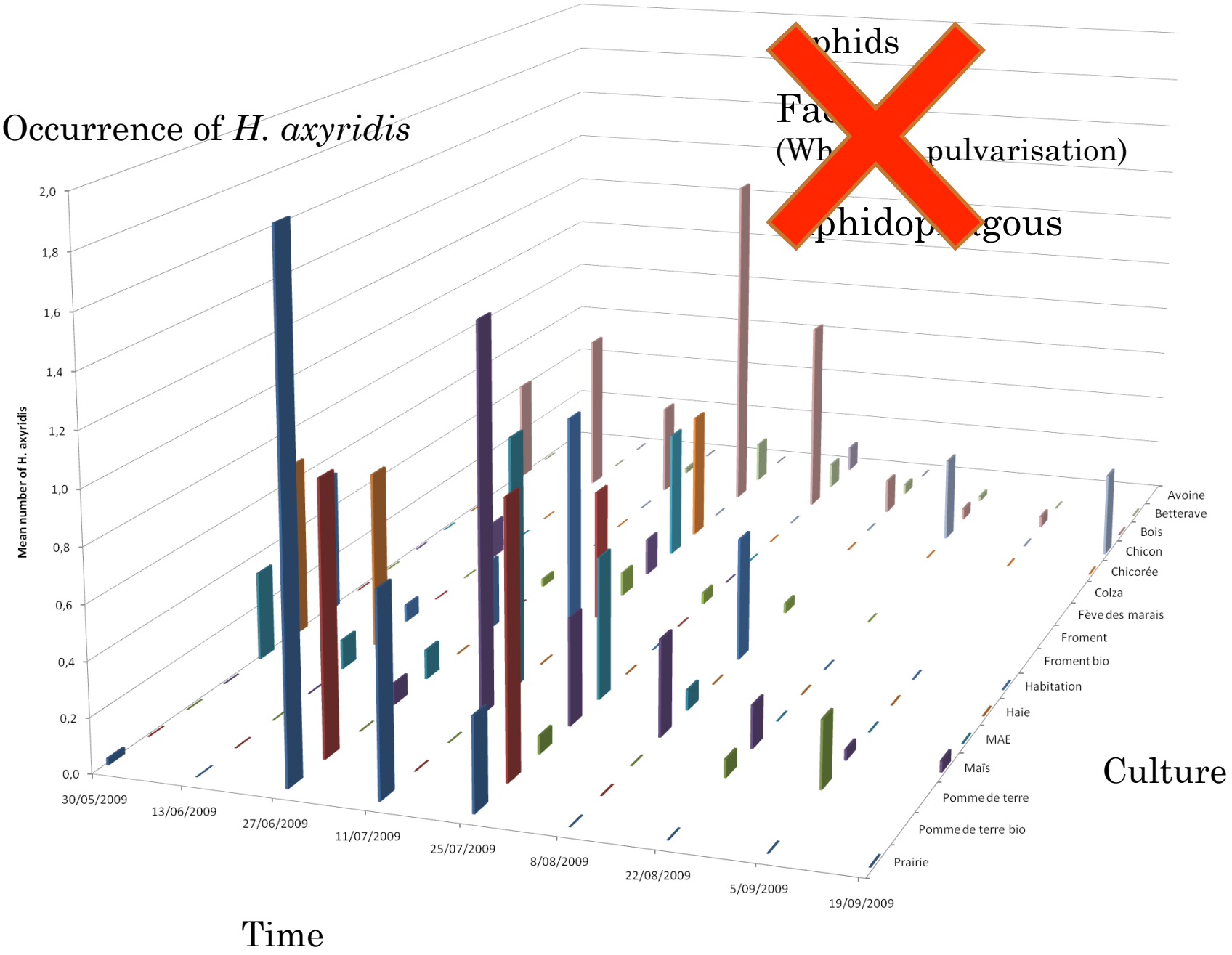
Conclusions

- *H. axyridis* is present in walloon agro-ecosystems
  - The most abundant of the Coccinellidae
  - Not the most abundant of the aphidiphagous species (hoverflies)
- There is predation of *H. axyridis* on other aphidophagous if the amount of food (aphids) is not sufficient
- More samplings have to be done to confirm the results and to explain the occurrences of Asian ladybirds

Discussion


Culture
Aphids
Evolution in time
Multicoloured ladybird
External factors
(Wheater, pulverisation)
Aphidophagous

Occurrence of *H. axyridis*

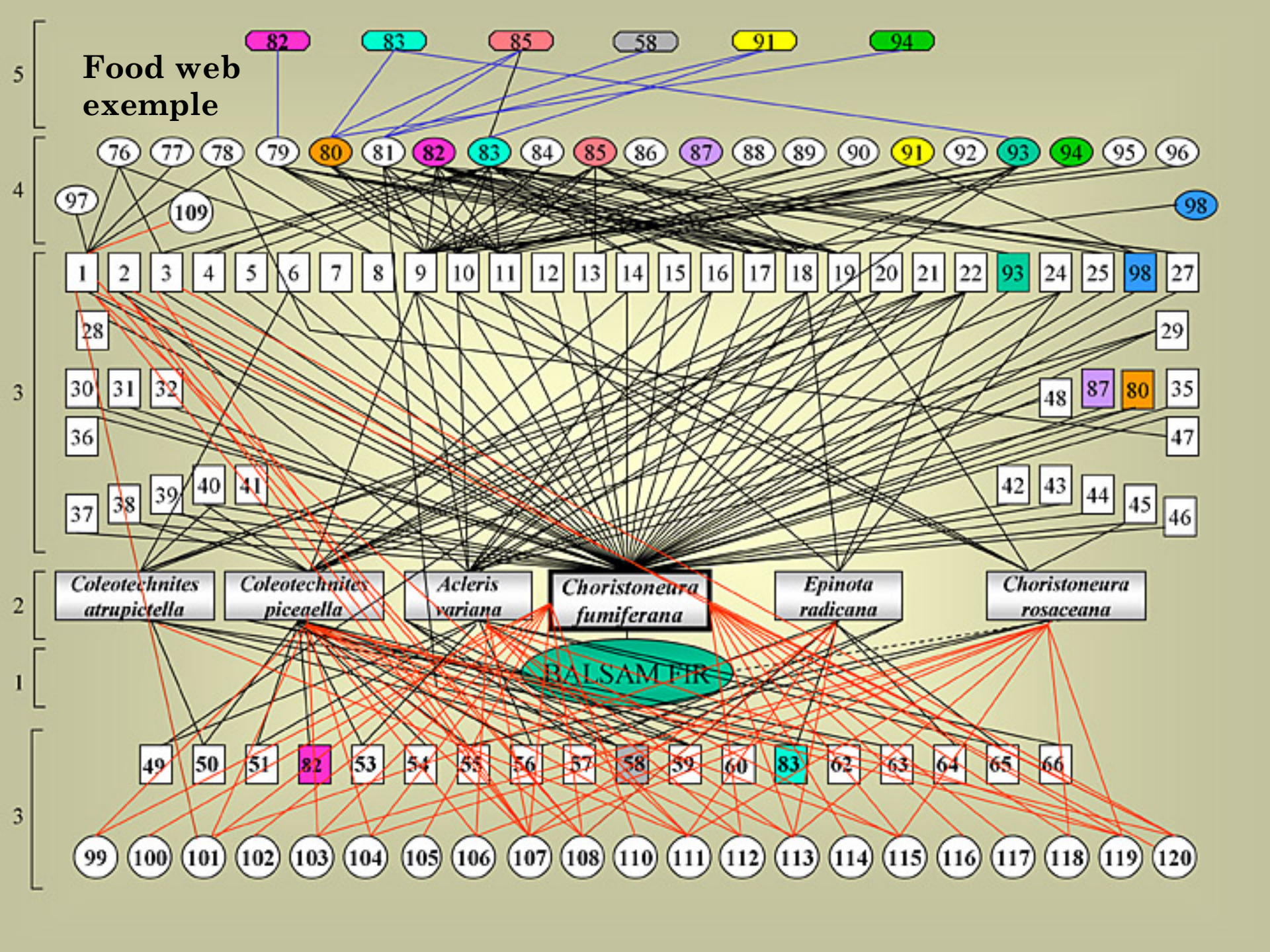


phids

Fac

(Wh pulvarisation)

phidop gous


Food web exemple
5
4
3
2
1
3
82
83
85
58
91
94
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
94
95
96
97
109
98
1
2
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22
93
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98
27
28
29
30
31
32
48
87
80
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39
40
41
42
43
44
45
46
Coleotechnites atrupictella
Coleotechnites piceaella
Acleris variana
Choristoneura fumiferana
Epinota radicana
Choristoneura rosaceana
BALSAM FIR
49
50
51
82
53
54
55
56
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59
60
83
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64
65
66
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Thank you for your attention