

The Multicoloured Asian Ladybird, invasive or not in agroecosystems ?

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Introduction

The Multicoloured Asian ladybird, *Harmonia axyridis* (Pallas) (Coleoptera: Coccinellidae), known to control aphid populations, is also an invasive species in many countries. In shrubby and arboreal habitats in Europe, *H. axyridis* is the most dominant coccinellid and causes a decline of native aphidophagous species. Information about its phenology and its occurrence in Belgian agroecosystems remains poorly documented. Aphidophagous samplings were performed from 2009 to 2012 in four agrosystems: broad bean, wheat, corn and potato. This study focuses on the occurrence and the phenology of native and exotic aphid predators. These results are stated in Vandereycken et al., 2013^{a,b,c}

Methods & Materials

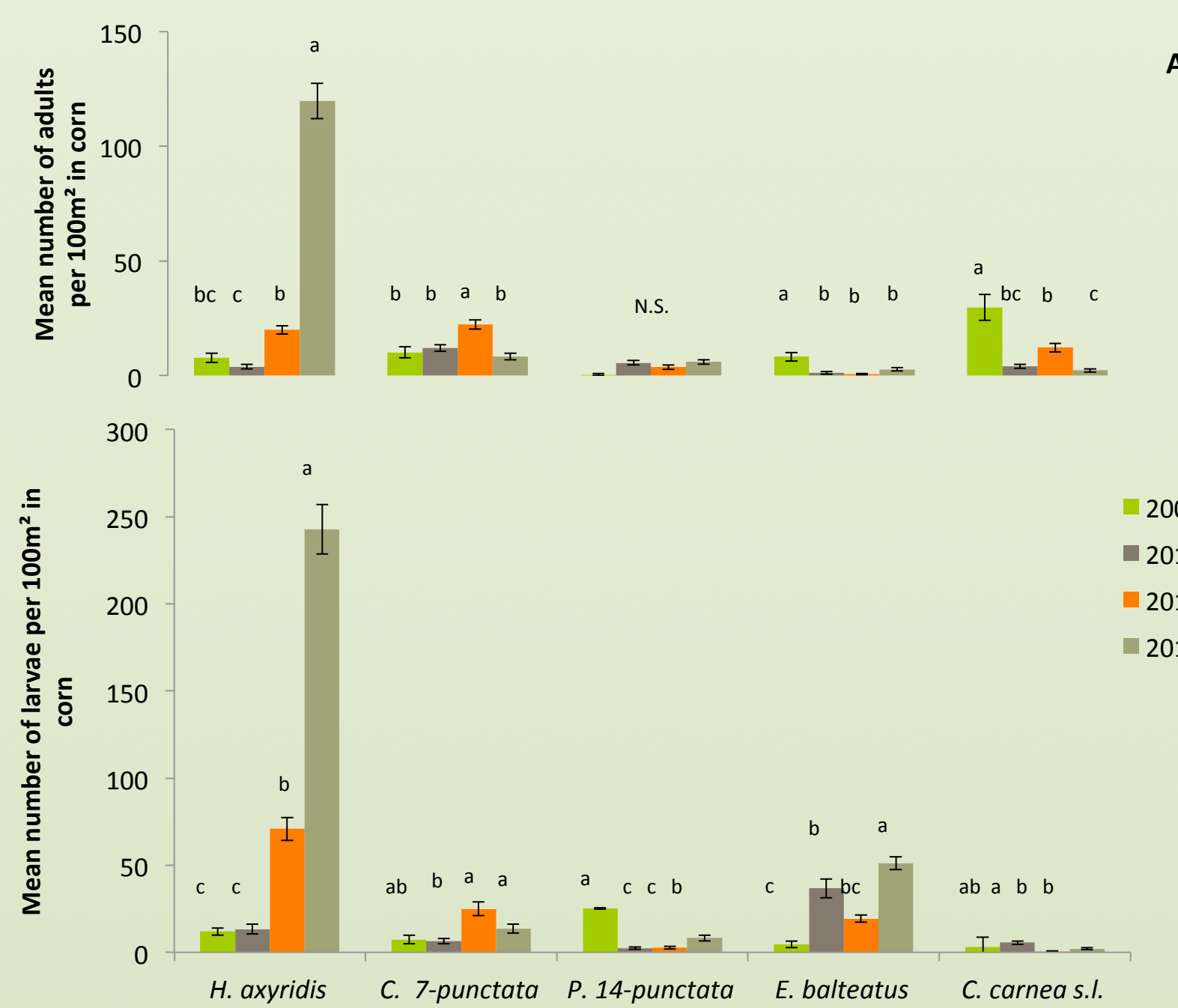
The study was conducted between 2009 and 2012 in the southern region of Belgium an intensive agricultural production area. Four crops were selected for their agronomic importance: wheat *Triticum aestivum* (L.); corn *Zea mays* (L.); potato *Solanum tuberosum* (L.) and broad bean *Vicia faba* (L.). Nine fields (surface > 1 hectare) were yearly selected and inventoried for each crop. They were all surrounded with conventional crops. Visual whole-plant inspections were realised from March to September, in forty-eight 1m² quadrats per crop.



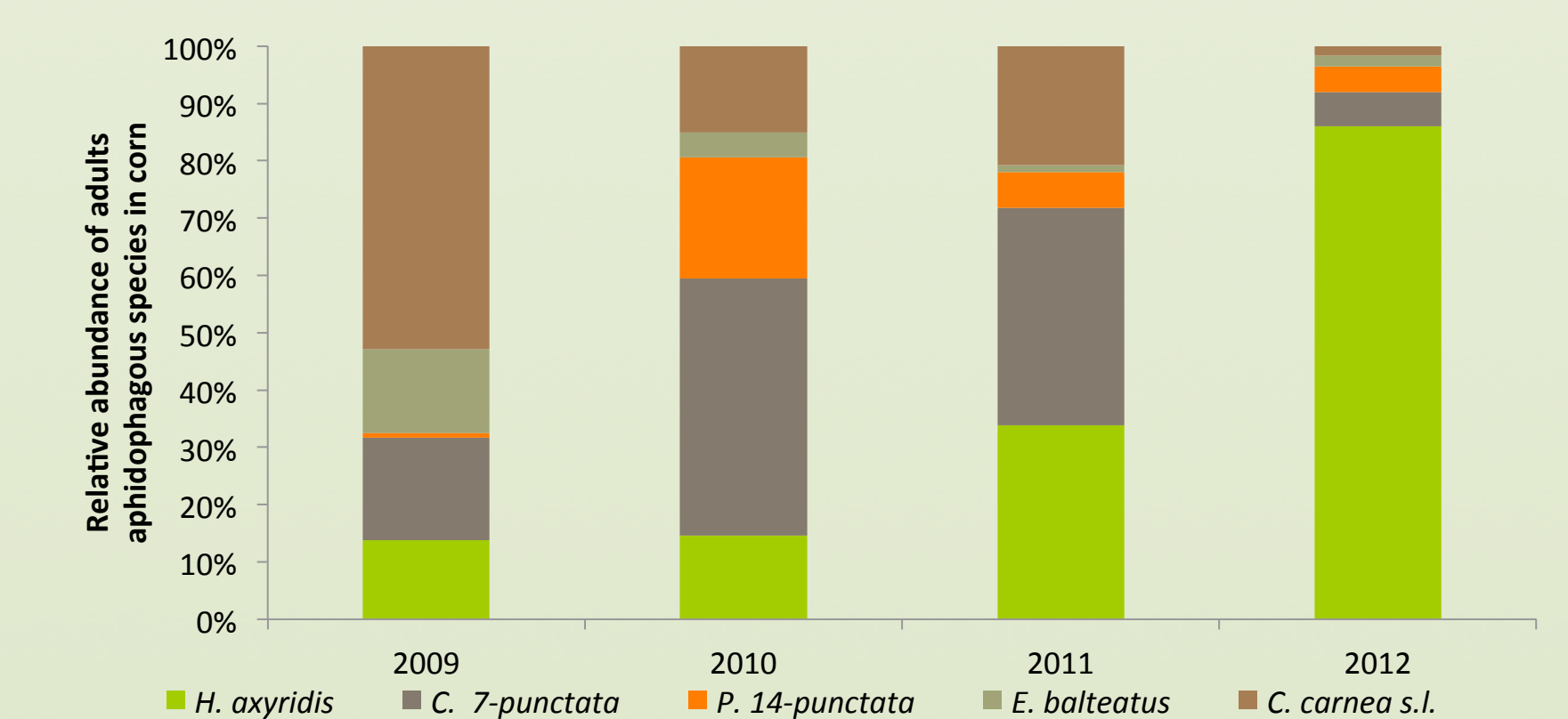
Results

| Family | Broad bean | | | Wheat | | | Corn | | | Potato | | | |
|----------------------------------|------------|------|------|-------|------|------|------|------|------|--------|------|------|----|
| | 2009 | 2010 | 2011 | 2009 | 2010 | 2011 | 2009 | 2010 | 2011 | 2009 | 2010 | 2011 | |
| <i>Chrysoperla carnea</i> s.l. | Ch | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Coccinella 7-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Episyrphus balteatus</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Harmonia axyridis</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Propylea 14-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| Hemerobiidae | He | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Metasyrphus latifasciatus</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Sphaerophoria scripta</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Metasyrphus corollae</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Sphaerophoria menthastris</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Coccinella 5-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Melanostoma mellinum</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Scaeva pyrastris</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Adalia 2-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Psyllobora 22-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Chilocorus renipustulatus</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Hippodamia variegata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Halyzia 16-guttata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Metasyrphus luniger</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Parasyrphus macularis</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Syrphus ribesii</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Syrphus vitripennis</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Adalia 10-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Calvia 14-guttata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Coccinella 11-punctata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Exochomus 4-pustulatus</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Hippodamia 11-notata</i> | Co | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Metasyrphus nitens</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| <i>Platycheirus clypeatus</i> | Sy | X | X | X | X | X | X | X | X | X | X | X | |
| Total per year | | 6 | 14 | 18 | 6 | 15 | 19 | 10 | 15 | 19 | 7 | 14 | 15 |
| Total per crop | | 20 | | | 23 | | | 22 | | | 19 | | |

99,9%

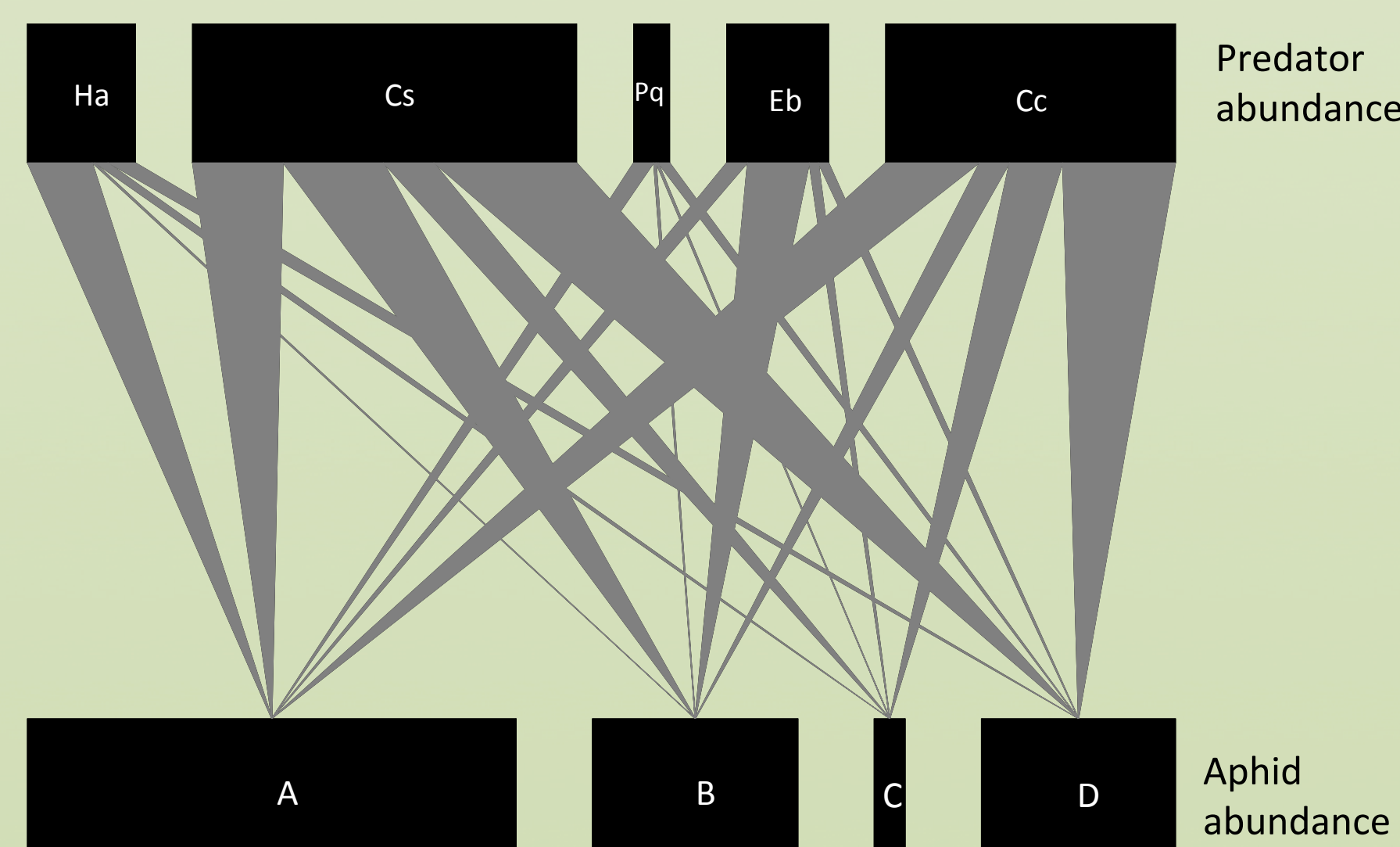


In corn, densities of *H. axyridis* increased from 2009 to 2012 (A: adults; B: larvae). For other native species, no change or decrease of densities were observed.

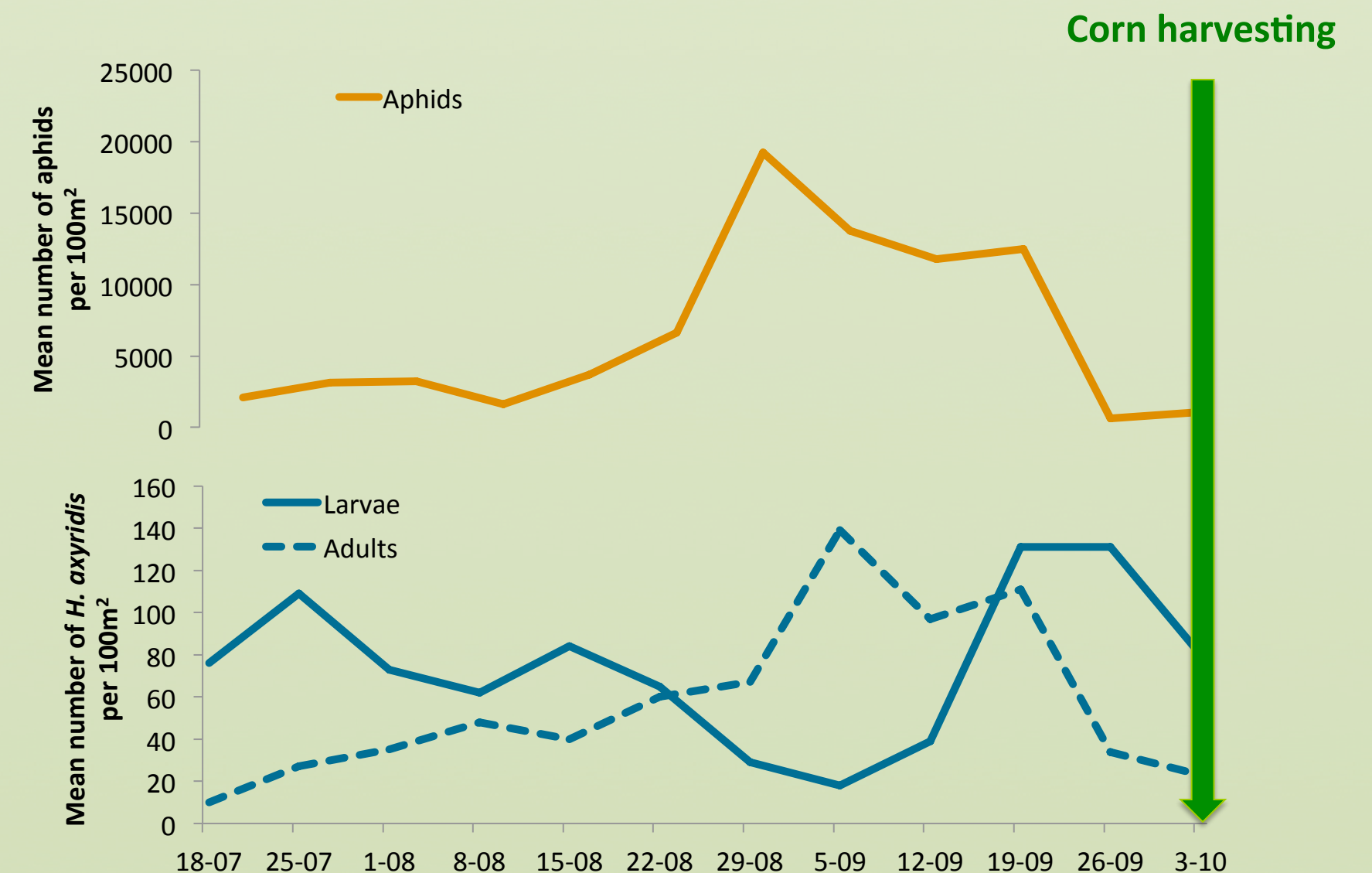


In corn, since 2009, relative abundance of *H. axyridis* increased from 15% to 86% in 2012.

28 predator species were observed in 4 different crops. 5 species were abundant (99.9% of observed predators): *H. axyridis*, *Coccinella septempunctata*, *Propylea quatuordecimpunctata*, *Chrysoperla carnea* and *Episyrphus balteatus*.



Repartition of the 5 most abundant aphid predators between 2009 and 2011. (Ha: *H. axyridis*, Cs: *C. septempunctata*, Pq: *P. quatuordecimpunctata*, Eb: *E. balteatus*, Cc: *C. carnea*, A: Corn, B: wheat, C: potato, D: broad bean)



Observations about phenology of *H. axyridis* and aphids in corn in 2012 show that there were two periods with larvae. One with low aphid densities between June and August, and a second in September. Larvae of the second period could not reach the adult stage because of corn harvesting.



H. axyridis larva

H. axyridis adults

Conclusion

Twenty eight aphid predator species were observed in this four years survey. Within these species, *H. axyridis* was one of the two most abundant predator species. *H. axyridis* was mainly found in corn. In this crop, *H. axyridis* populations increased slightly from 2009 to 2011. In 2012, however, we observed a greater increase, as 86% of the predators were *Ha*. Native population of predator species did not change for *C. septempunctata*, *E. balteatus*, *P. quatuordecimpunctata* but densities decreased for *C. carnea*. Two periods of reproduction were recorded in corn for *H. axyridis* but the second did not give adults. To conclude, in agroecosystems *H. axyridis* population increased seriously these last years, making the impact of intraguild predation potentially important on native species.

^a Vandereycken A., Brostaux Y., Joie E., Haubruge E. & Verheggen F.J. (2013). Occurrence of *Harmonia axyridis* (Coleoptera: Coccinellidae) in field crops. *European Journal of Entomology* 110(2), p. 285-292.
^b Vandereycken A., Durieux D., Joie E., Sloggett J.J., Haubruge E. & Verheggen F.J. (2013). Is *Harmonia axyridis* the most abundant aphidophagous species in agroecosystems? *Journal of Insect Science* In press.
^c Vandereycken A., Joie E., Francis F., Haubruge E. & Verheggen F.J. (2013). Occurrence of aphid predator species in both organic and conventional corn and broad bean. *Entomologie Faunistique - Faunistic Entomology* 66, p. 77-87.