

# THE IMPACT OF LANDSCAPE ON THE DIVERSITY OF NATURAL ENEMIES IN GREENHOUSES IN QUÉBEC

## Introduction

Vegetables produced in greenhouses need repeated introduction of biocontrol agents to regulate population of different pests. In Quebec, 70% of vegetables greenhouses are 1000m<sup>2</sup> or less with diversified productions (1-6 different vegetables by greenhouses). Natural enemies (NE) from the landscape around are often observed in those greenhouses and could be interesting natural enemies of pests.

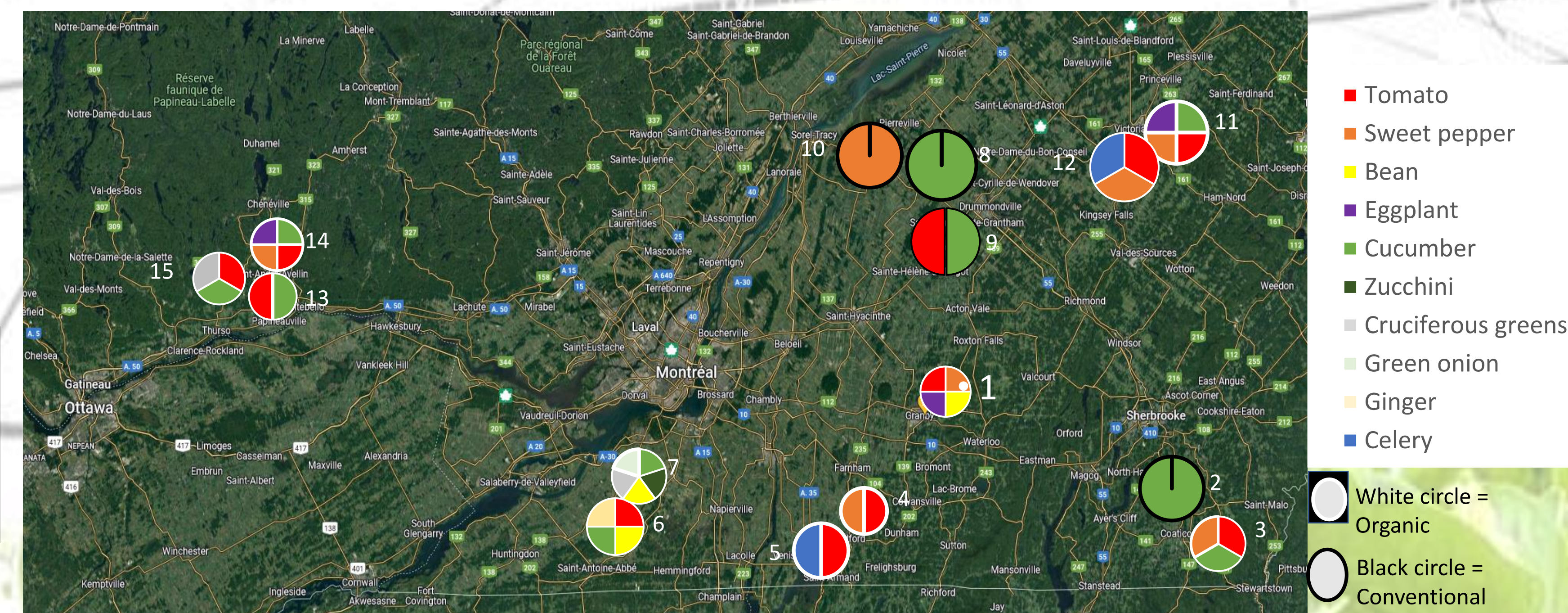
**Objective:** The first objective of this project was to identify potential natural enemies (NE) visiting the greenhouses and the parameters of the agronomic regimes and landscapes that favorize them.

## Methods

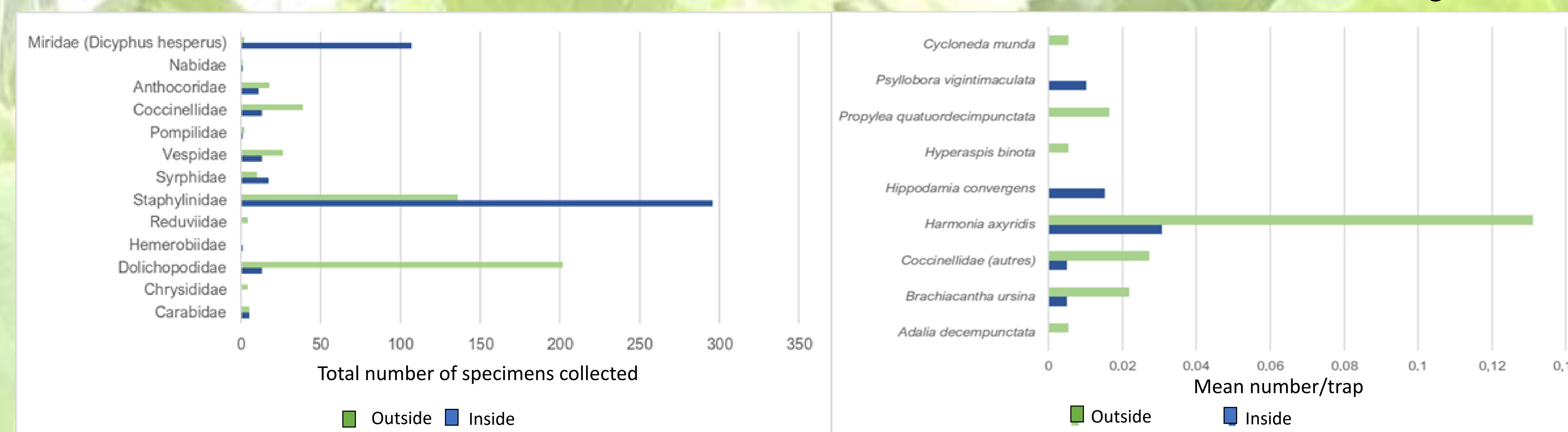
- Monitoring inside and outside 15 greenhouses in 2020 and 2021 (Figure 1.)
- Yellow sticky traps (3/greenhouses; 3/outside greenhouses)
- Pan traps (3/greenhouses; 3/outside greenhouses)
- Banker plants of wheat and *Rhopalosiphum padi* (3/greenhouses)
- Visual observations (10 plants/crops/greenhouses)
- Identification of weeds outside of the greenhouse (6-12 quadrats of 0,5m<sup>2</sup>)
- Sweep net outside of the greenhouses (10 sweeps/4 borders).
- Agronomic parameters inside and outside greenhouses were noted : crops, fertilization and irrigation regime, abiotic conditions (temperature, humidity in the air and soil) and pesticides used.
- Landscape parameters on 200m around each greenhouses.

## Results and discussion

- 8687 beneficials arthropods identified, from 79 different taxas
- 12 species of coccinellids; 12 species of hoverflies, hundreds of specimens of dipterans predators (Tachinidae and Dolichopodidae) and predatory bugs (Anthocoridae, Miridae, Nabidae, Reduviidae) have been observed outside and inside greenhouses.
- 20 families of parasitoids wasps and 5 families of indigenous pollinators have been observed inside and outside greenhouses.
- 16 taxas observed on different crops inside greenhouses in 2020 and 2021 (2219 specimens observed) (Figure 2).
- Abundance and diversity of predators (Figure 3) and coccinellids (Figure 4) varied greatly between the outside and inside of some of the greenhouses.
- Great influence of the diversity of plants (adventives weeds – Figure 5 and crops – Figure 6) inside and outside the greenhouses. Families of adventives plants that increase diversity are Asteraceae, Caryophyllaceae, Fabaceae, Amaranthaceae, and Onagraceae.
- Conservative methods of biological control should be considered.

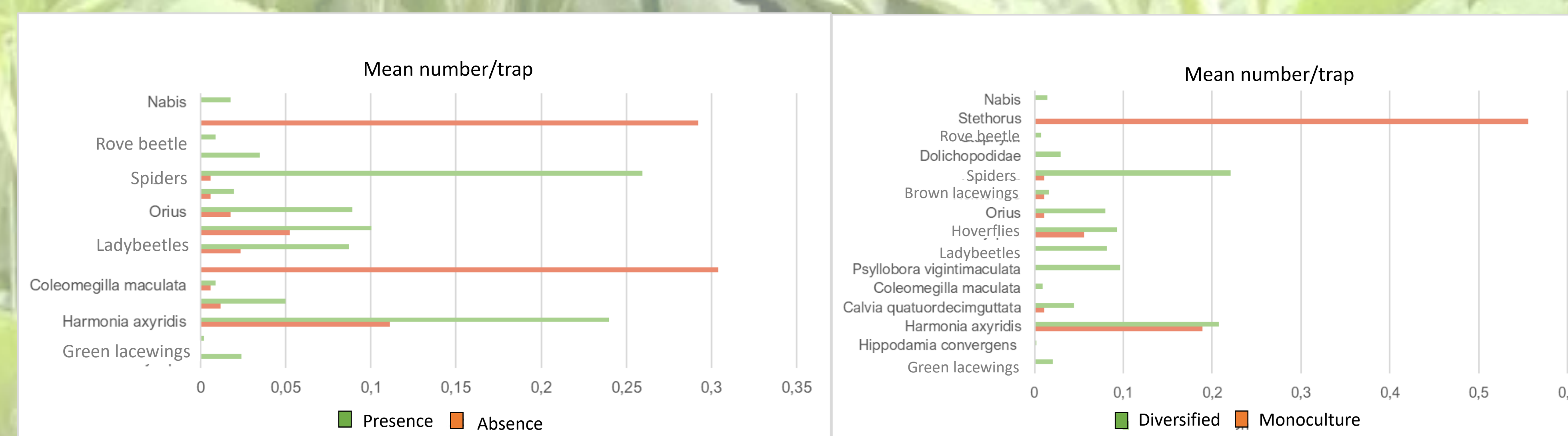


**Figure 1.** Localization, type of greenhouses (organic or conventional) and crops observed in the 15 greenhouses during 2020 and 2021.



**Figure 3.** Total abundance of predators in pan trap inside and outside greenhouses in 2020 and 2021.

**Figure 4.** Mean abundance of coccinellids in pan trap inside and outside greenhouses in 2020 and 2021.

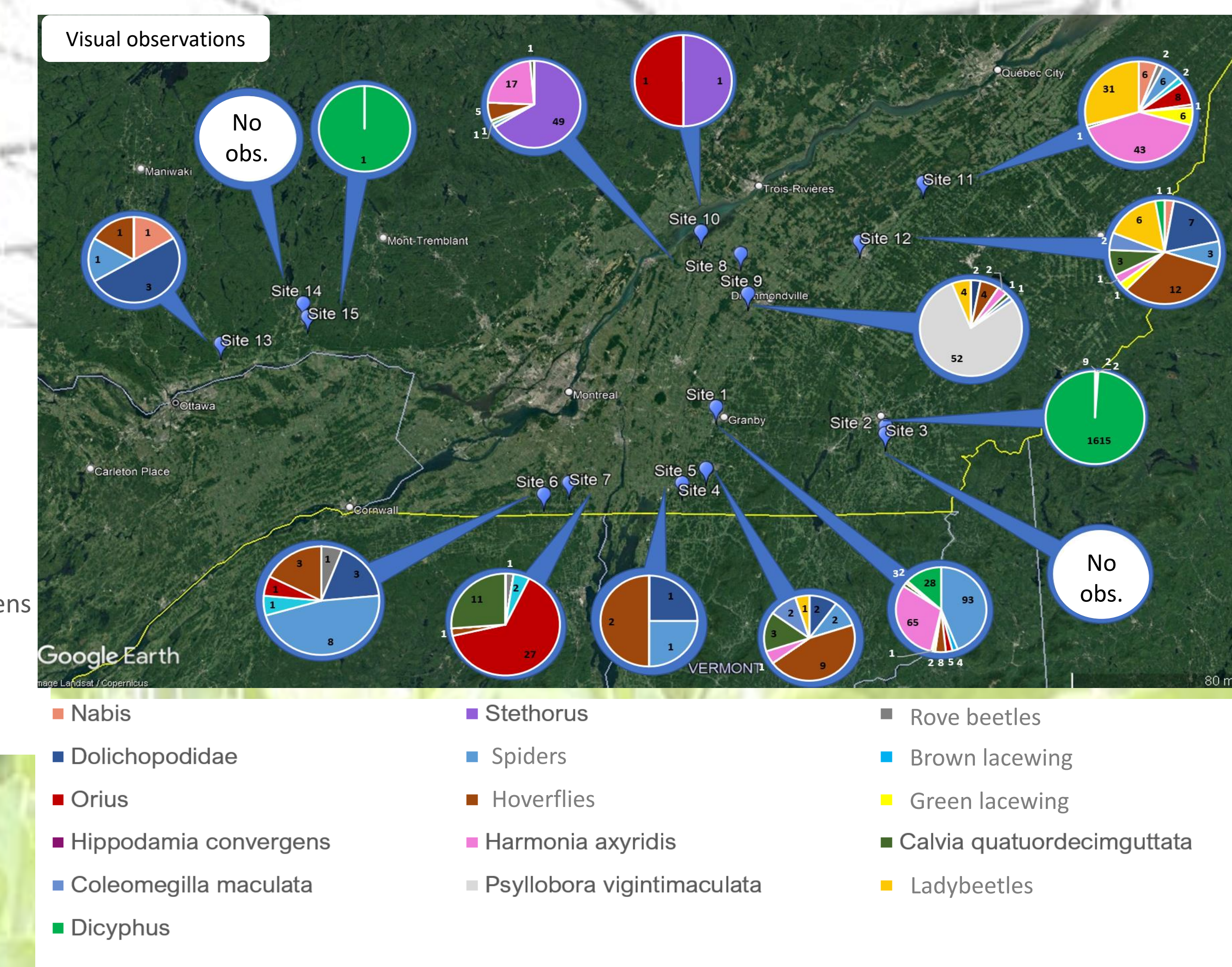


**Figure 5.** Mean abundance of predators in presence or not of adventives weeds inside and outside greenhouses.

**Figure 6.** Mean abundance of predators when greenhouse is diversified or in monoculture.



Examples of adventive weeds around greenhouses



**Figure 2.** Natural enemies observed in the 15 greenhouses during 2020 and 2021.



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