

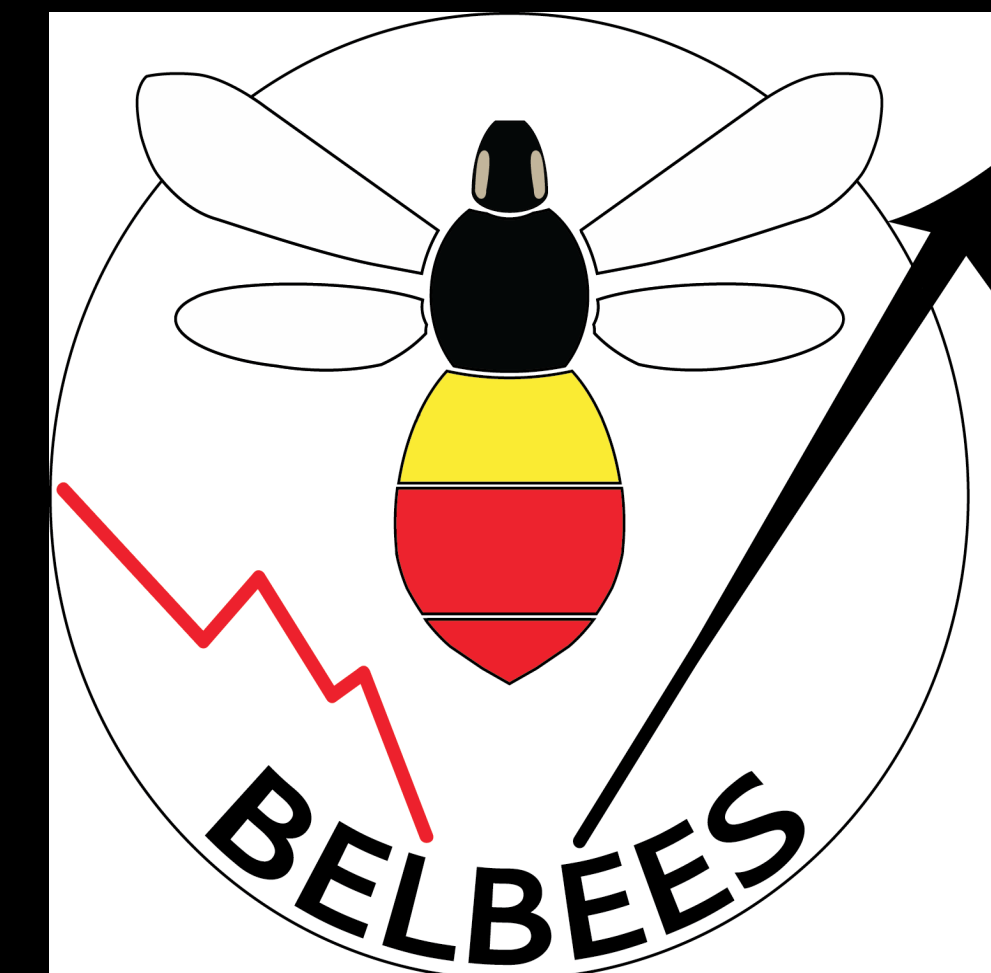


Bombus rupestris foraging *Carduus nutans*, photo P. Rasmont

May regulation against thistles threaten bumblebees?

Vray S.^{1,2}, Rollin O.³, Lecocq T.^{1,4}, Roberts S.P.M.⁵ & Rasmont P.¹

⁽¹⁾ Research Institute for Biosciences, University of Mons, Mons, Belgium; ⁽²⁾ Department of Geography, University of Namur, Namur, Belgium; ⁽³⁾ BIOSystem Engineering Department, University of Liège - Gembloux AgroBioTech, Gembloux, Belgium; ⁽⁴⁾ Research Unit Animal and Functionalities of Animal Products (URAFPA), University of Lorraine – INRA, Vandoeuvre-lès-Nancy, France; ⁽⁵⁾ Visiting Research Fellow, Reading University, Reading RG6 6AR, UK



Introduction

- ❖ Many bumblebee (*Bombus*) species are undergoing a strong decline in Europe due to, amongst other things, a decrease of food resources. While leguminous plants (Fabaceae) are considered to be one of the main pollen sources of bumblebees, thistles (Asteraceae, tribe Cardueae) have been suggested to be important for male diet.
- ❖ Several European countries apply strict regulations against thistles (considered to be one of the principal weeds in agricultural landscapes), which could disturb male diet and ecology, and thus impact bumblebee conservation.
- ❖ **Objective** : to assess the importance of thistles for bumblebee males across countries and evaluate the potential consequences of regulations against thistles on bumblebee conservation.

Methods

❖ **Thistle definition**: defined as all species included in Cardueae, a monophyletic worldwide tribe in the Asteraceae family (2400 species in 73 genera [1] Barres et al. 2013)

❖ **Study area**: countries with a regulation against thistles (Table 1, Fig 1)

❖ **Dataset**: we used opportunistic data consisting of 88,974 field observation of bumblebee (exclusively feeding on flowers), recorded in the database BDFGM (*Banque de Données Fauniques de Gembloux et Mons* [2]). Then we focus on the four thistle species affected by national regulations (Table 1)

Table 1. National regulations requiring the control of thistles in the European Union

Countries	Period	Species concerned
Belgium	1987 to present	<i>Carduus crispus</i> <i>Cirsium arvense</i> <i>Cirsium palustre</i> <i>Cirsium vulgare</i>
France	1994 to present	<i>Cirsium arvense</i>
Netherlands (only provinces Friesland, Utrecht, Noord-Holland, Zeeland, Zuid-Holland, Noord-Brabant)	1950 to present	<i>Cirsium arvense</i> <i>Cirsium palustre</i> <i>Cirsium vulgare</i>
United Kingdom	1959 to present	<i>Cirsium arvense</i> <i>Cirsium vulgare</i>

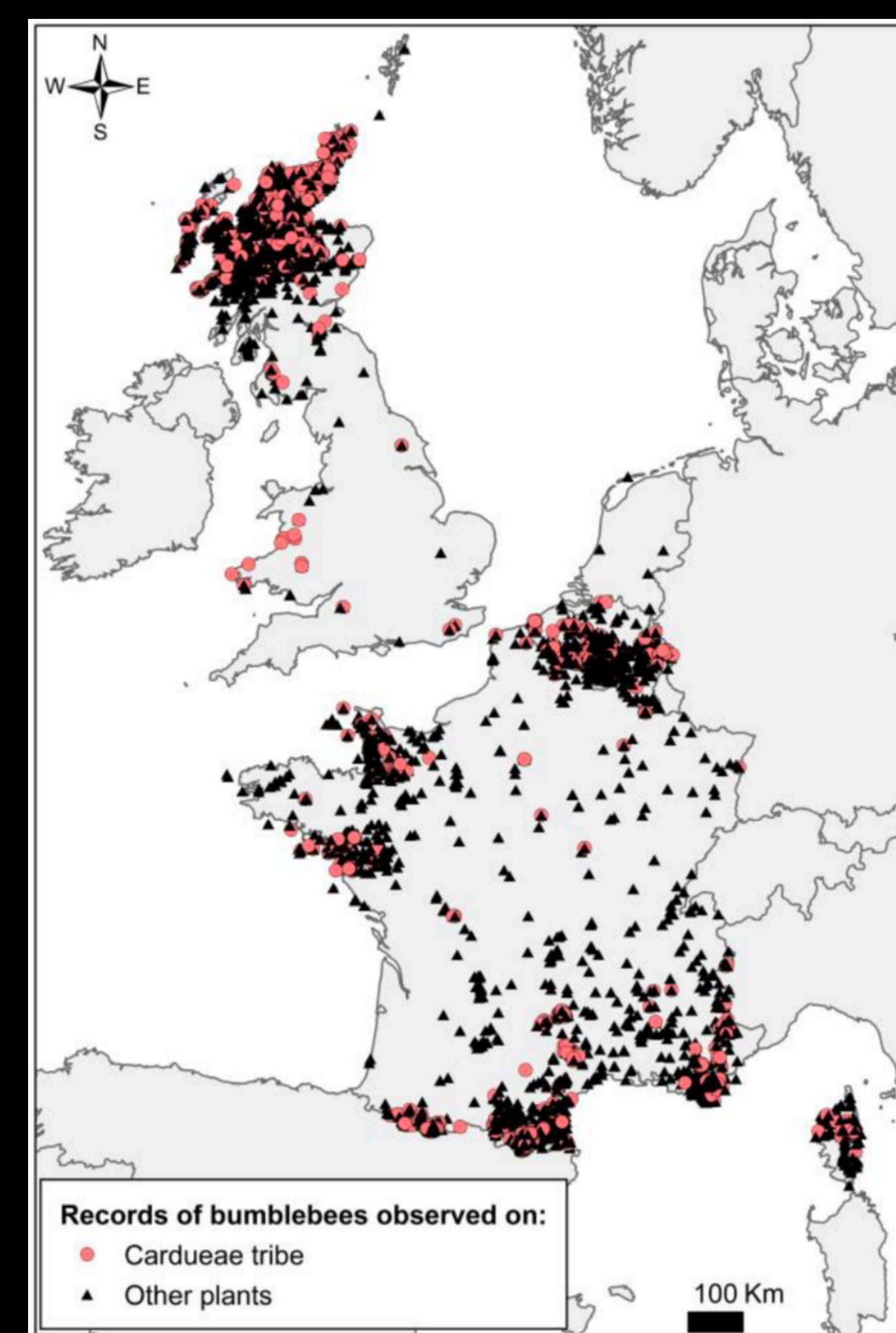


Figure 1. Spatial distribution of the bumblebee observations feeding on flower in the four countries affected by thistle regulations (Belgium, France, the Netherlands and UK)

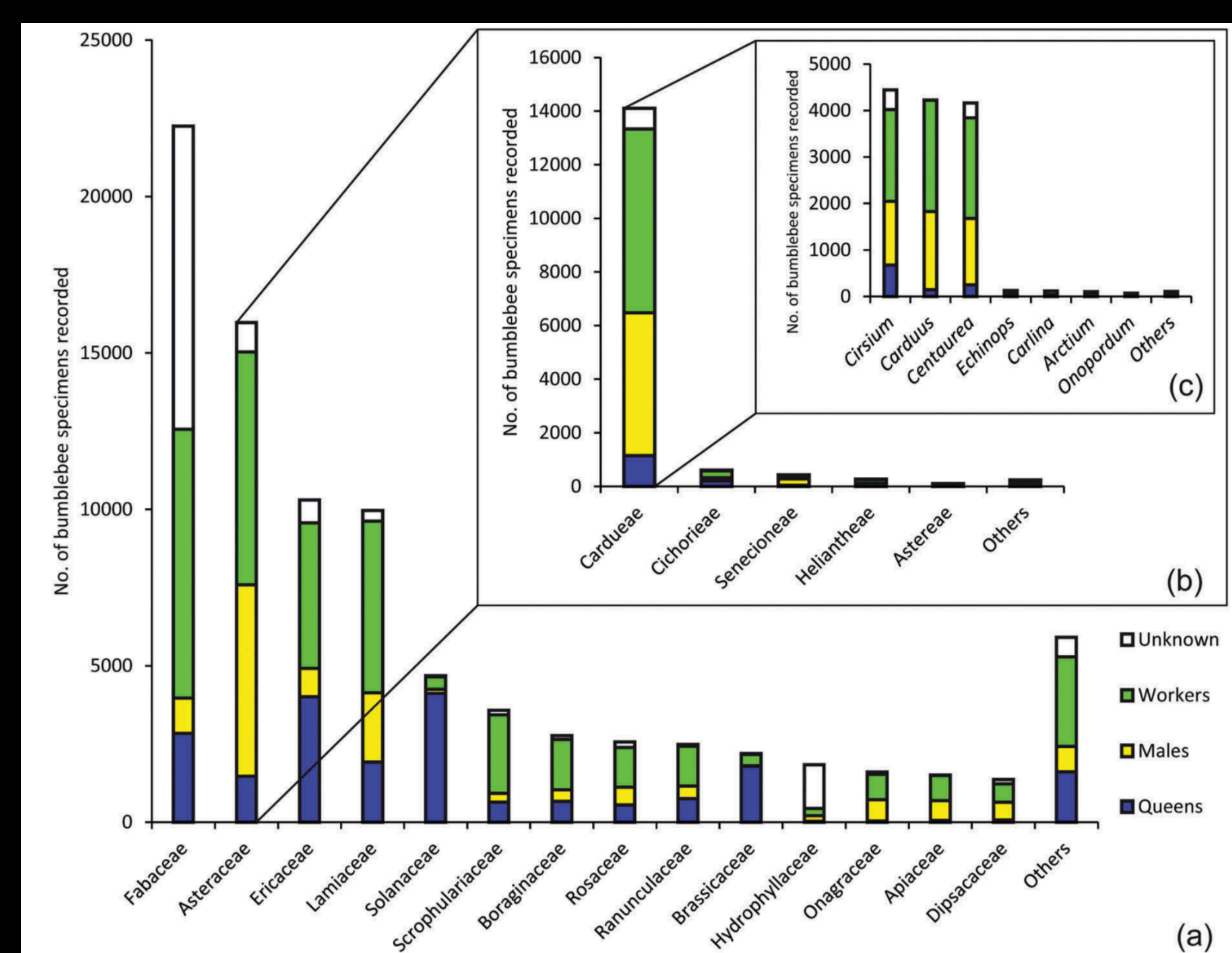


Figure 2. Number of bumblebee specimens recorded on different (a) plant families ($n=88,974$ specimens), (b) tribes of the Asteraceae family ($n=15,746$ specimens), and (c) genera of the Cardueae tribe ($n=13,353$ specimens).

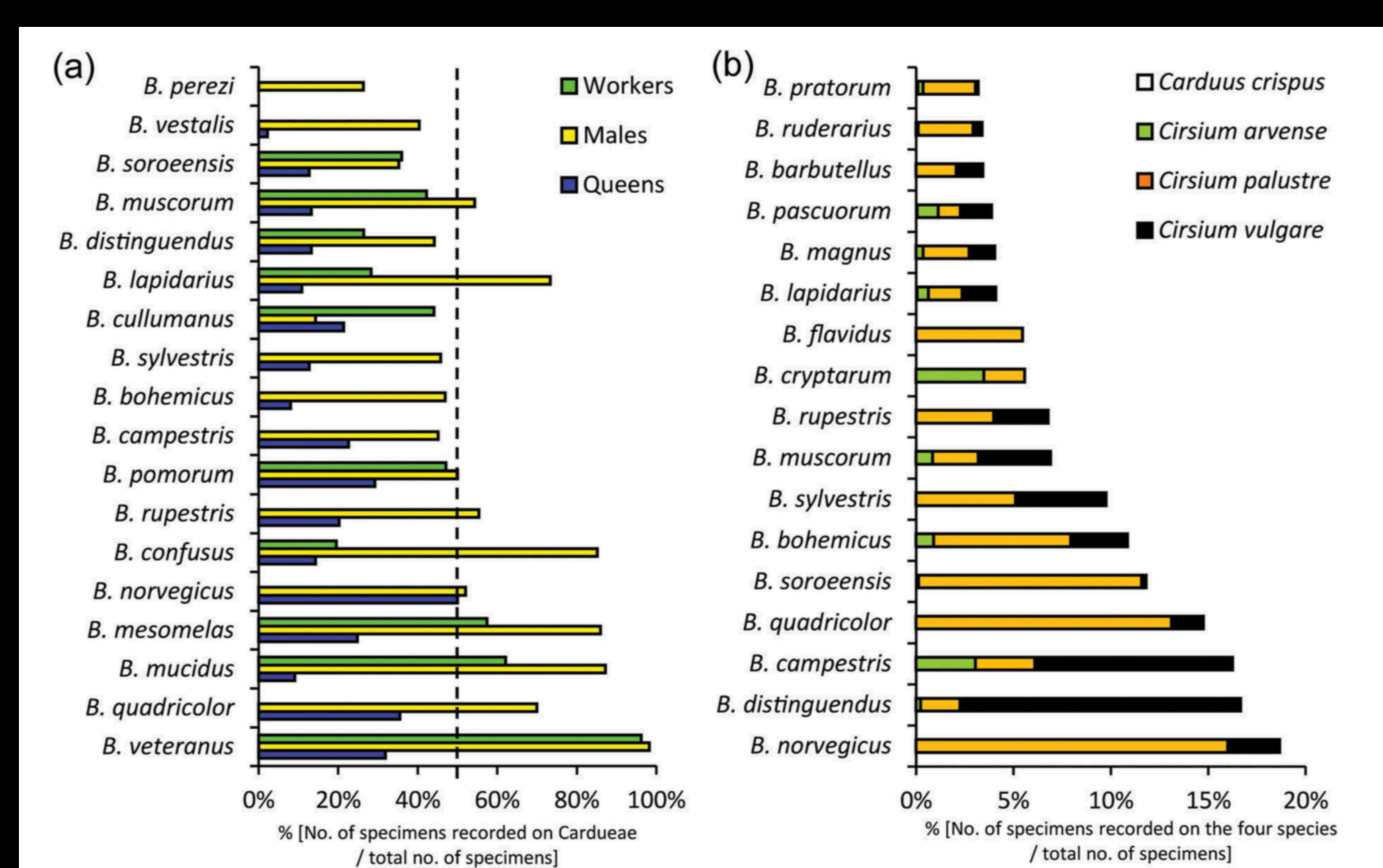


Figure 3. Proportion of bumblebee observed on (a) Cardueae and (b) the four thistle species concerned by the regulations. Only species with a percentage higher than (a) 25% and (b) 3% (for all castes combined) are presented

Results

- ❖ Males were significantly more observed on Asteraceae than on other families (Fig 2a) (41% of the 15,007 male observations). Queens were mainly observed on Solanaceae, Ericaceae, and Fabaceae families (respectively 20%, 19% and 14% of the 20,567 queen observations; only 7% on Asteraceae) and workers on Fabaceae, Asteraceae and Lamiaceae families (respectively 22%, 19% and 14% of the 38,892 worker observations)
- ❖ Among observations on Asteraceae, the Cardueae tribe was significantly more visited than other tribes by males and workers (Fig 2b)
- ❖ The observation of males and workers were quite equitably distributed among the three genera (Fig 2c; respectively 36 and 35% for *Carduus*, 30 and 32% for *Centaurea*, and 29% both for *Cirsium*)
- ❖ For several species, more than half of recorded visits were to this tribe. (Fig 3a): *Bombus veteranus* (95% of the observations), *B. quadricolor* (61%), *B. mucidus* (59%), *B. mesomelas* (56%) and *B. norvegicus* (52%)
- ❖ The most frequently observed bumblebee species on the four regulated thistles species were *B. norvegicus*, *B. distinguendus*, *B. campestris*, *B. quadricolor*, *B. soroensis*, *B. bohemicus* and *B. sylvestris* (Fig 3b)

Discussion & Perspectives

- ❖ Most floral visit observations of males occur on thistles (mainly *Cirsium* spp. and *Carduus* spp.) an some species are almost exclusively observed on them
- ❖ The thistle regulations could thus (i) greatly reduce the availability of food resources for, especially, bumblebee males during mating period; and (ii) decrease offspring production, reinforcing the bumblebee decline through the population size decrease and the “extinction vortex”
- ❖ Thistle removal acts may affect several other plant species, including Fabaceae, the main food resources for bumblebee female, due to difficult identification of the species by farmers and landowners

References

[1] Barre L et al. 2013. Reconstructing the evolution and biogeographic history of tribe Cardueae (Compositae). American Journal of Botany.
[2] Rasmont P, Iserbyt S. 2013. Atlas of the European Bees: genus *Bombus*. 3rd. Mons (Gembloux): STEP Project, Atlas Hymenoptera. Available from: <http://www.zoologie.umh.ac.be/hymenoptera/page.asp?ID=169>.

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