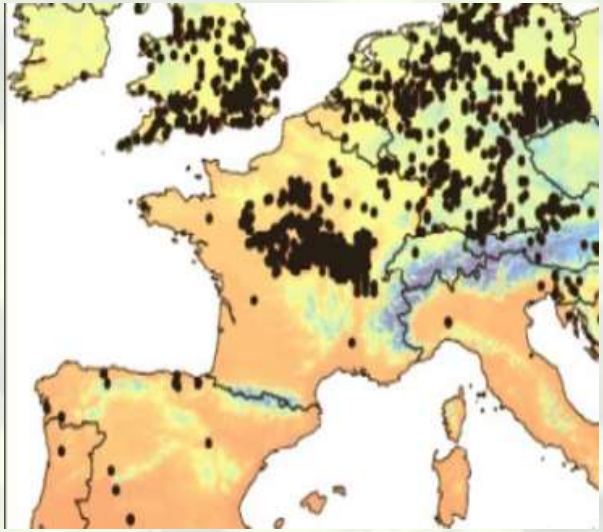
No performance reduction at the present northern edge of *Ambrosia artemisiifolia* L. invasion range

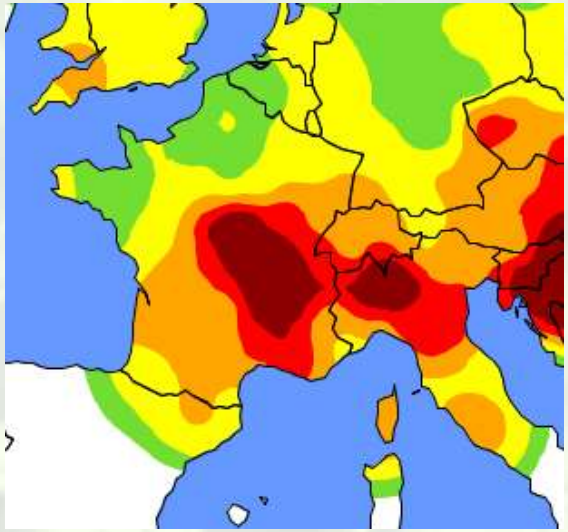
William Ortmans, Bruno Chauvel, Grégory Mahy, Arnaud Monty

4th International Symposium on Weeds and Invasive Plants
May 18-23 2014 Montpellier, France

- ***A. artemisiifolia* distribution in Western Europe**



Global Biodiversity Information Database (GBIF)



European Aeroallergen Network and European Pollen Information

Delivering Alien Invasive Species Inventories for Europe (DAISIE)

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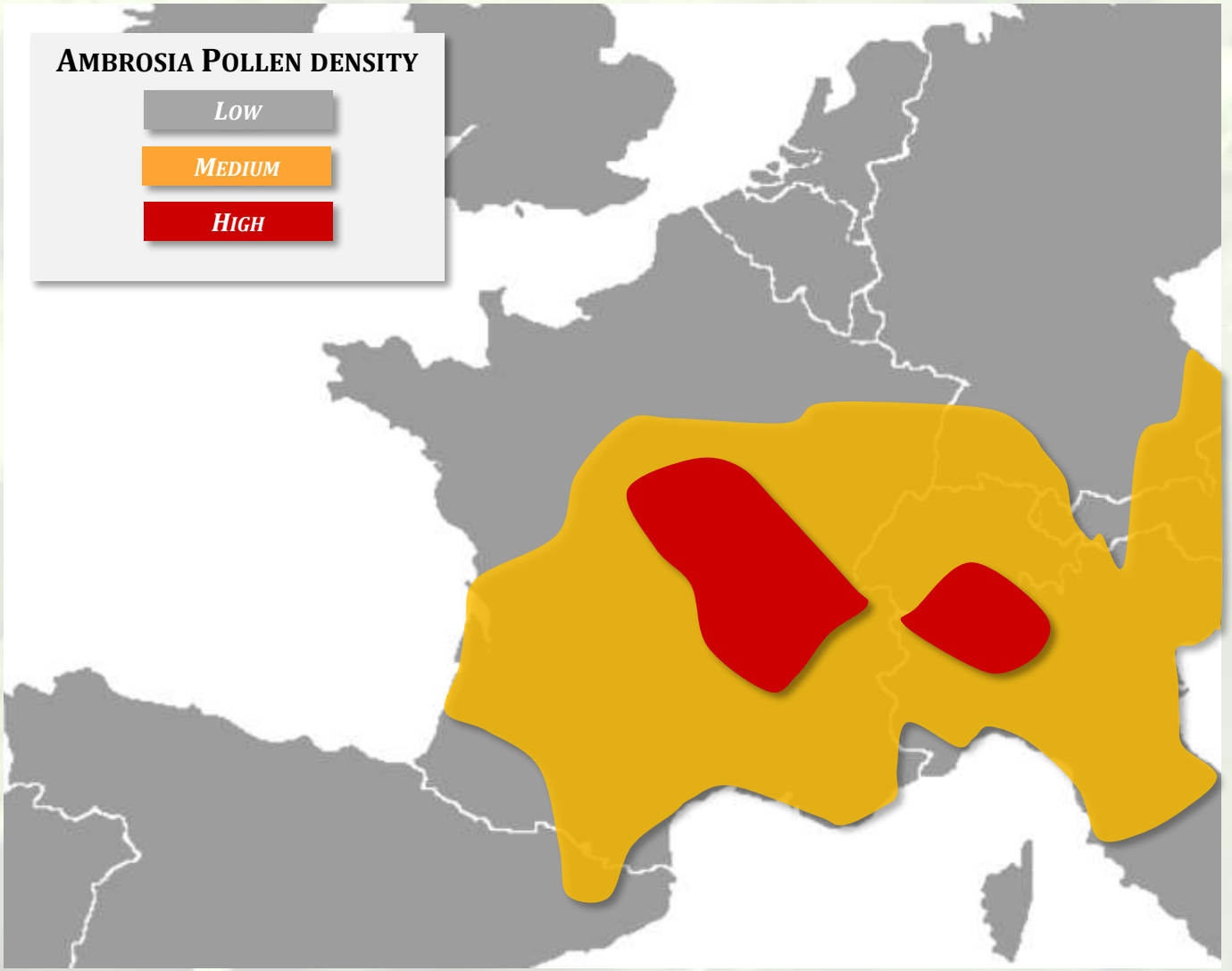

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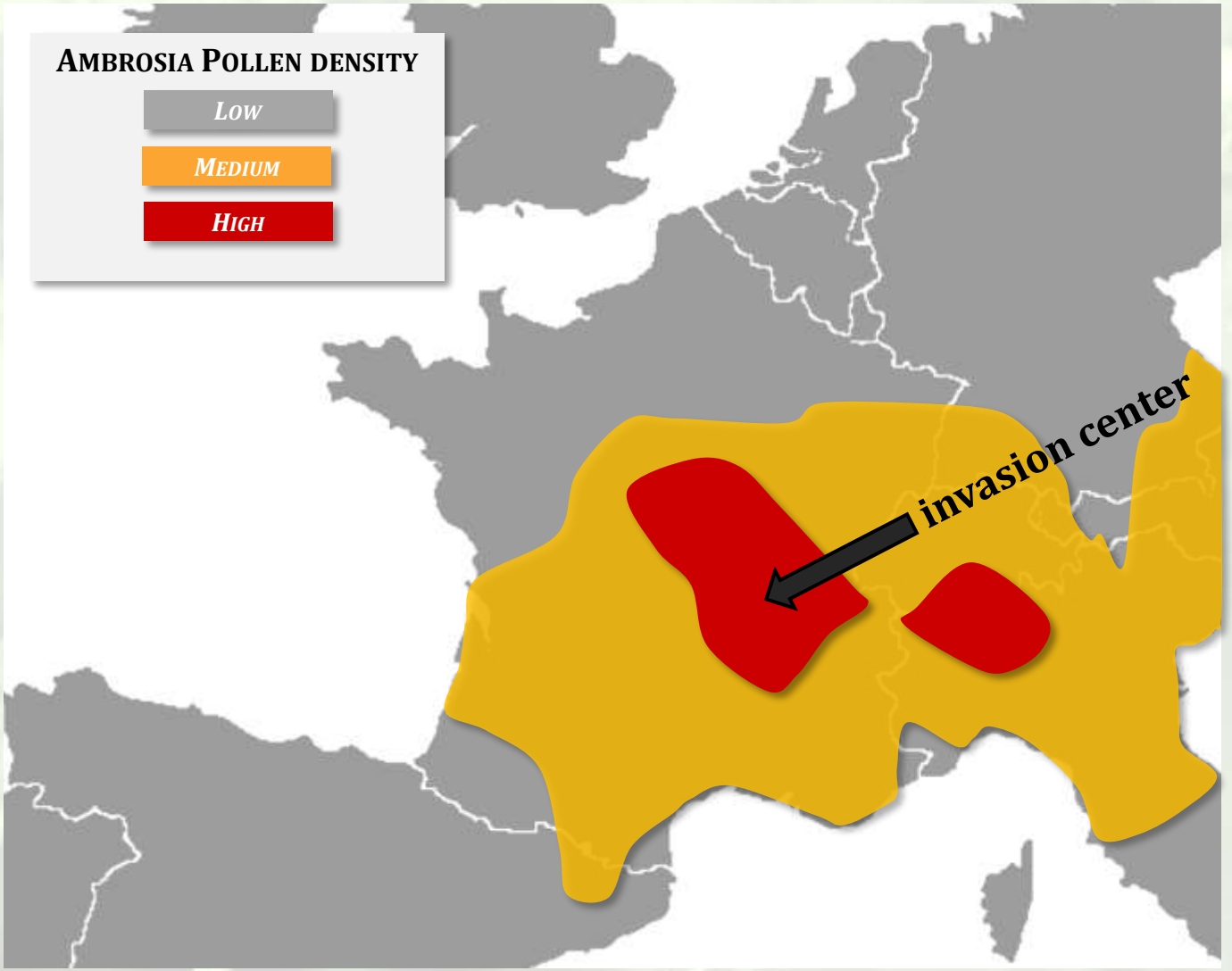

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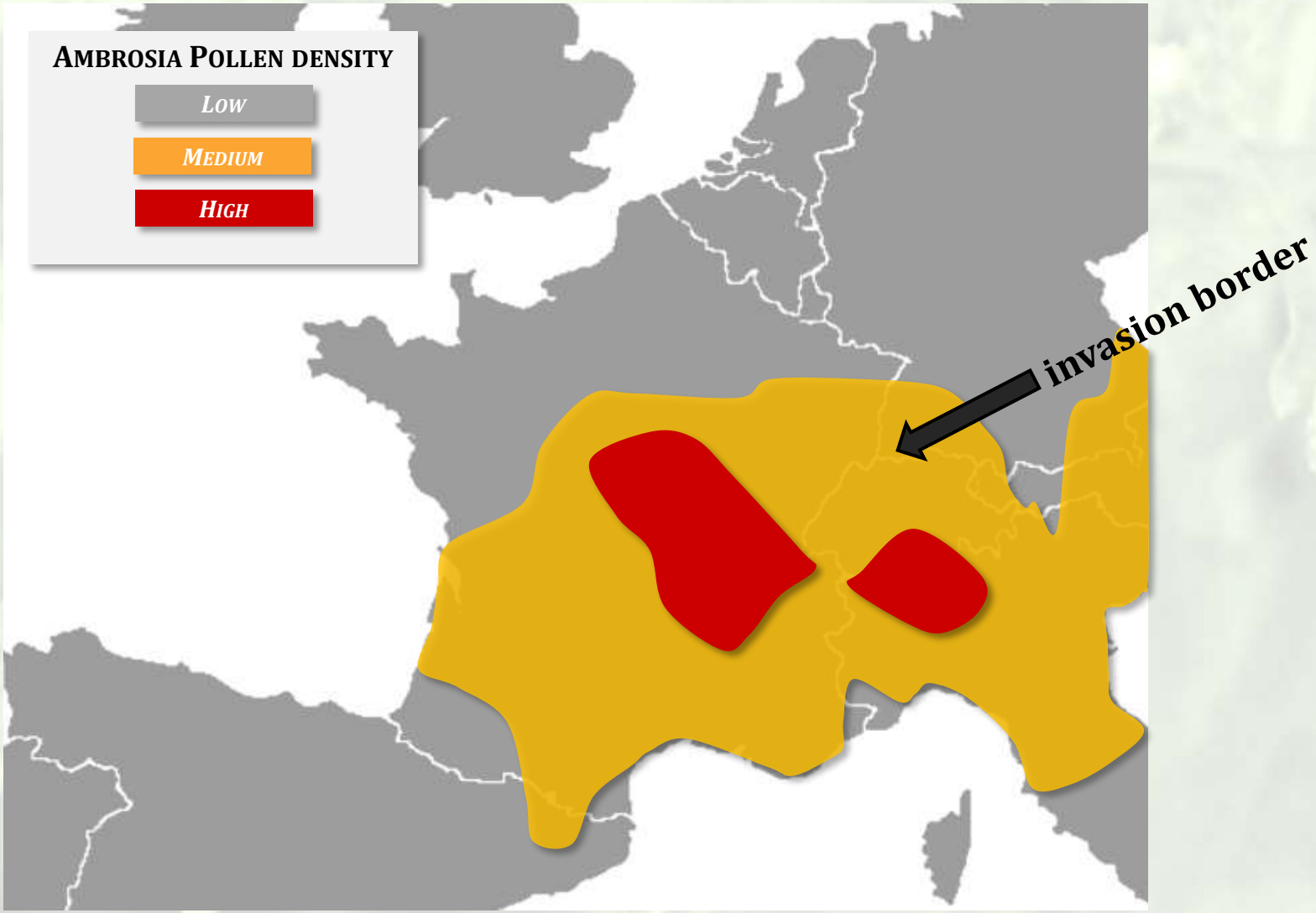

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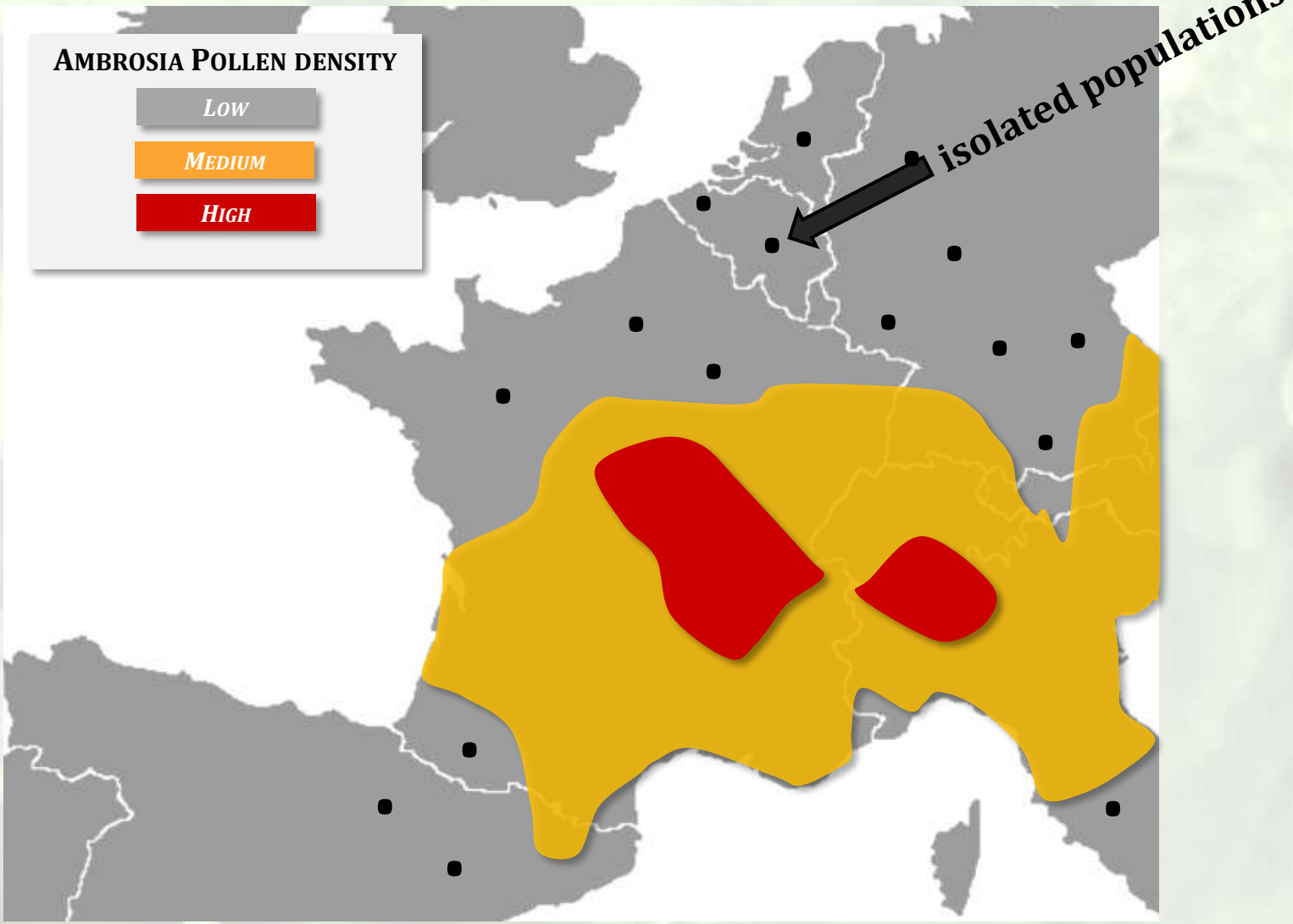

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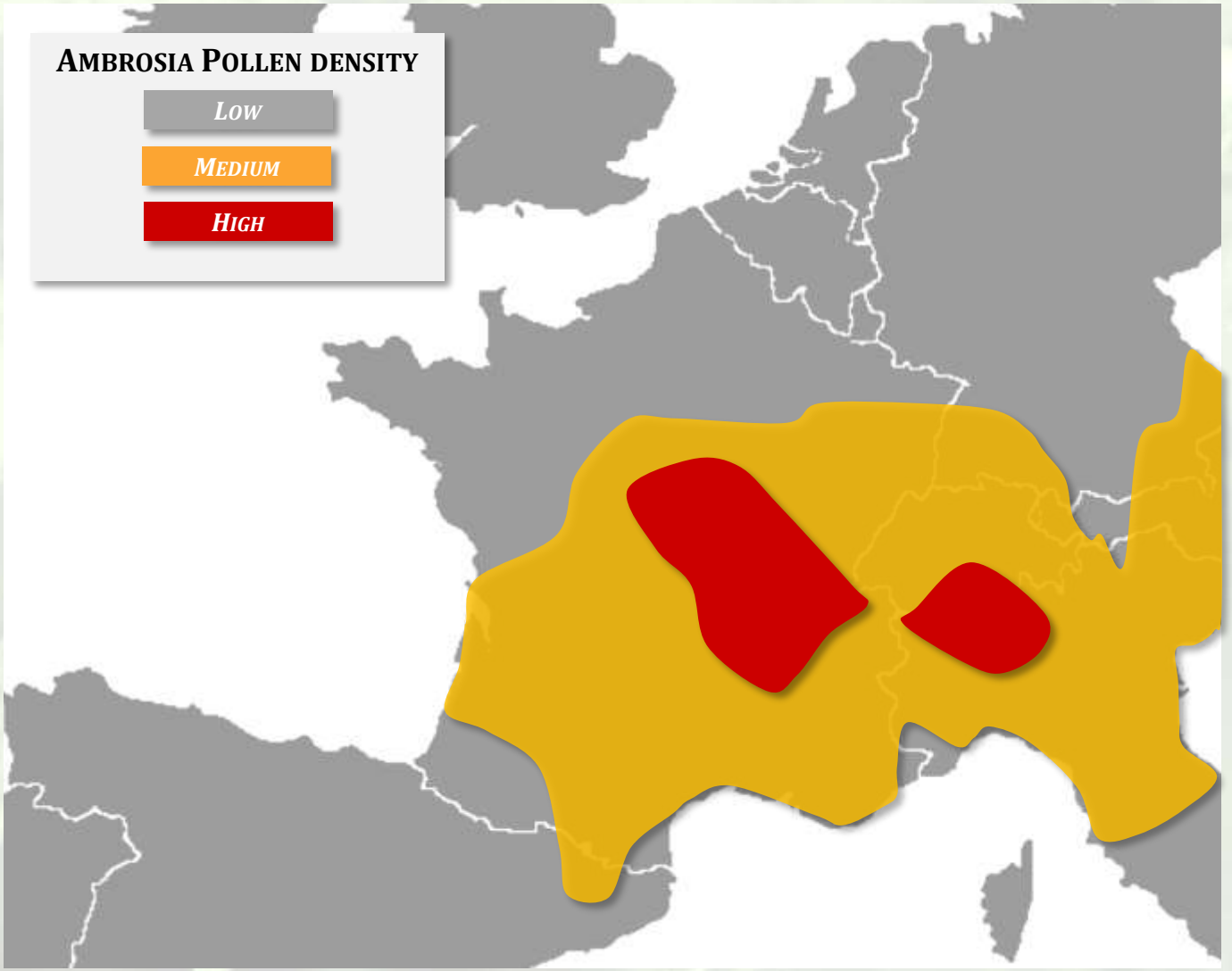

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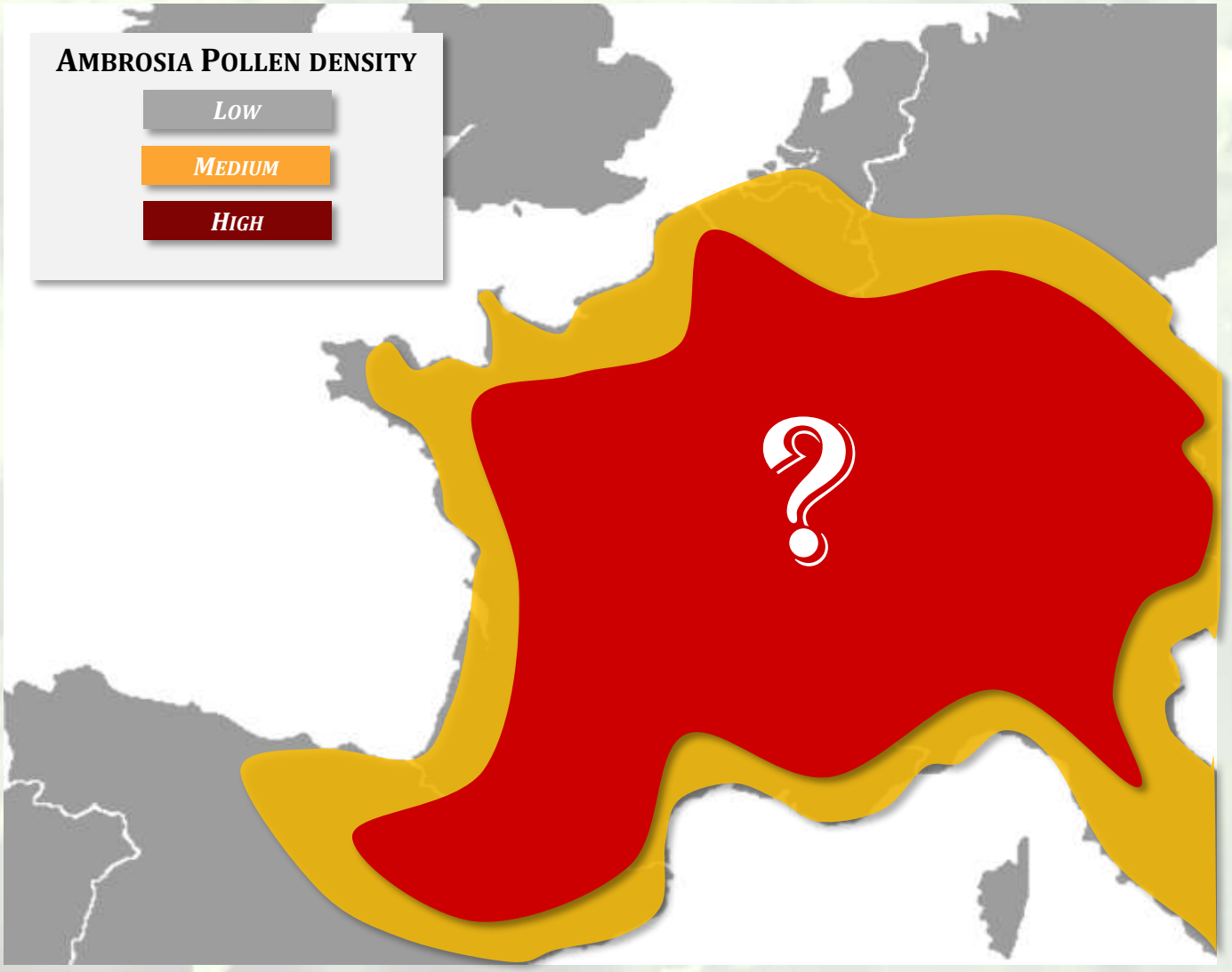

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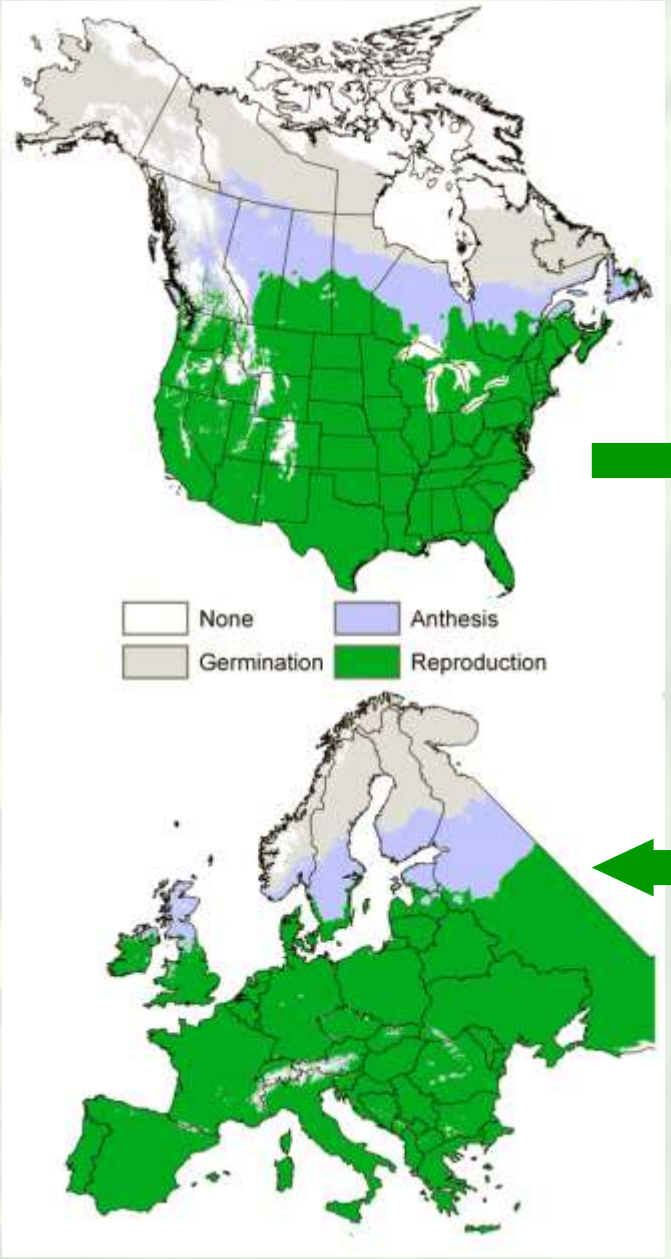

Bullock 2010

- **How the invasion will evolve?**

  1) Climate modeling

  2) Field study

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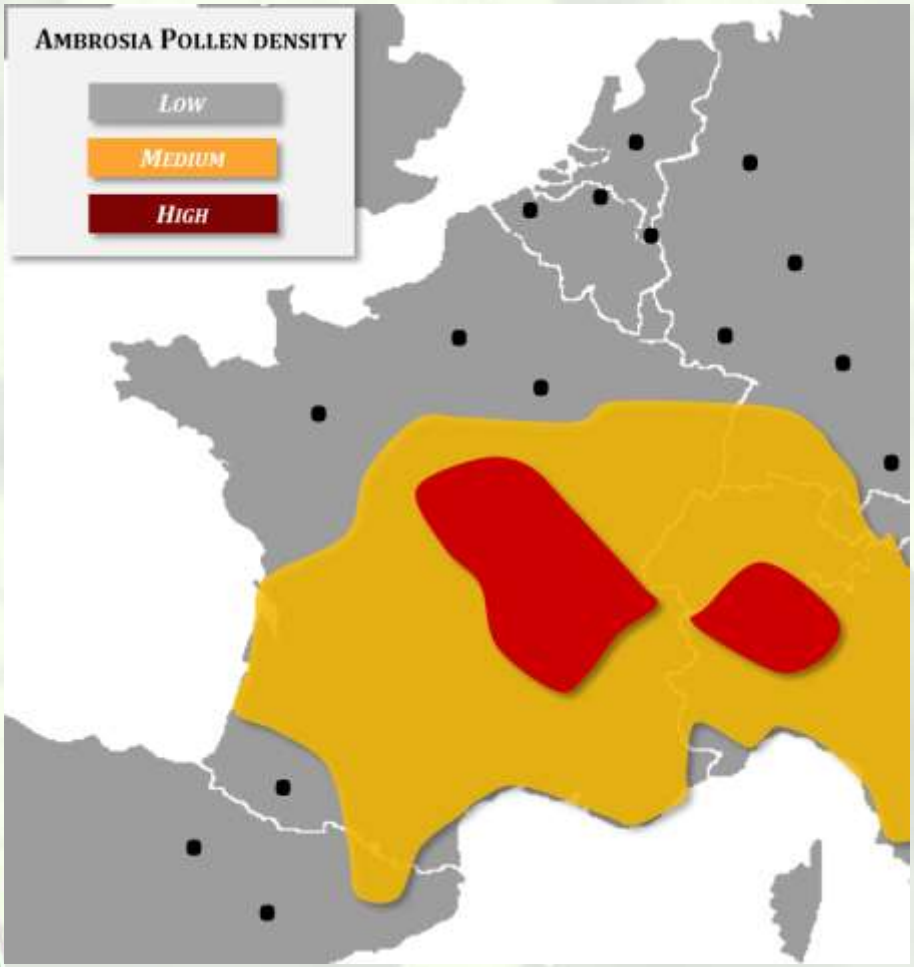

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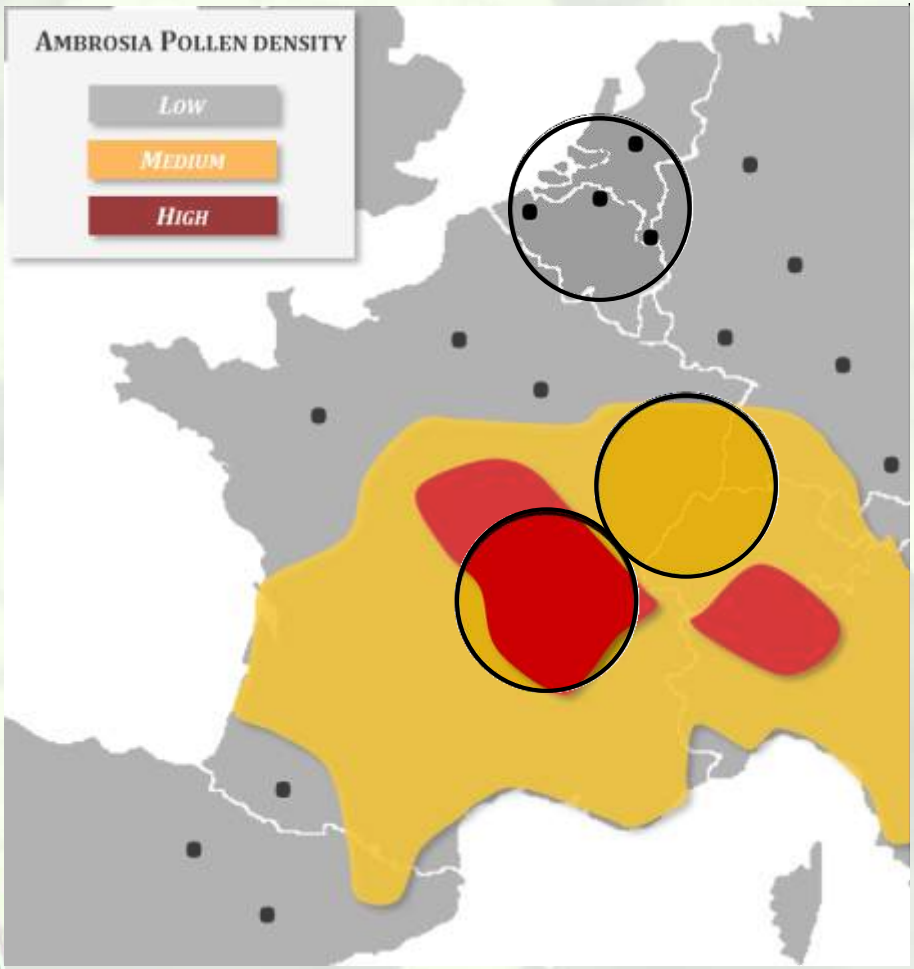

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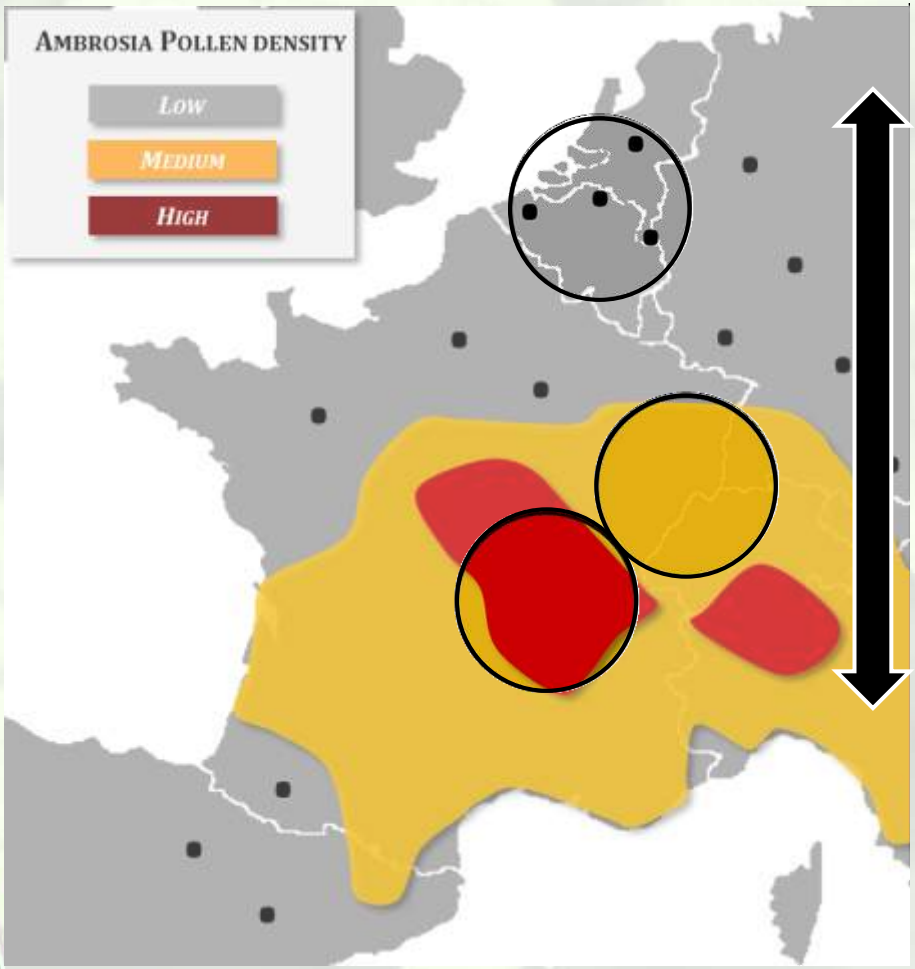

Performances comparisons

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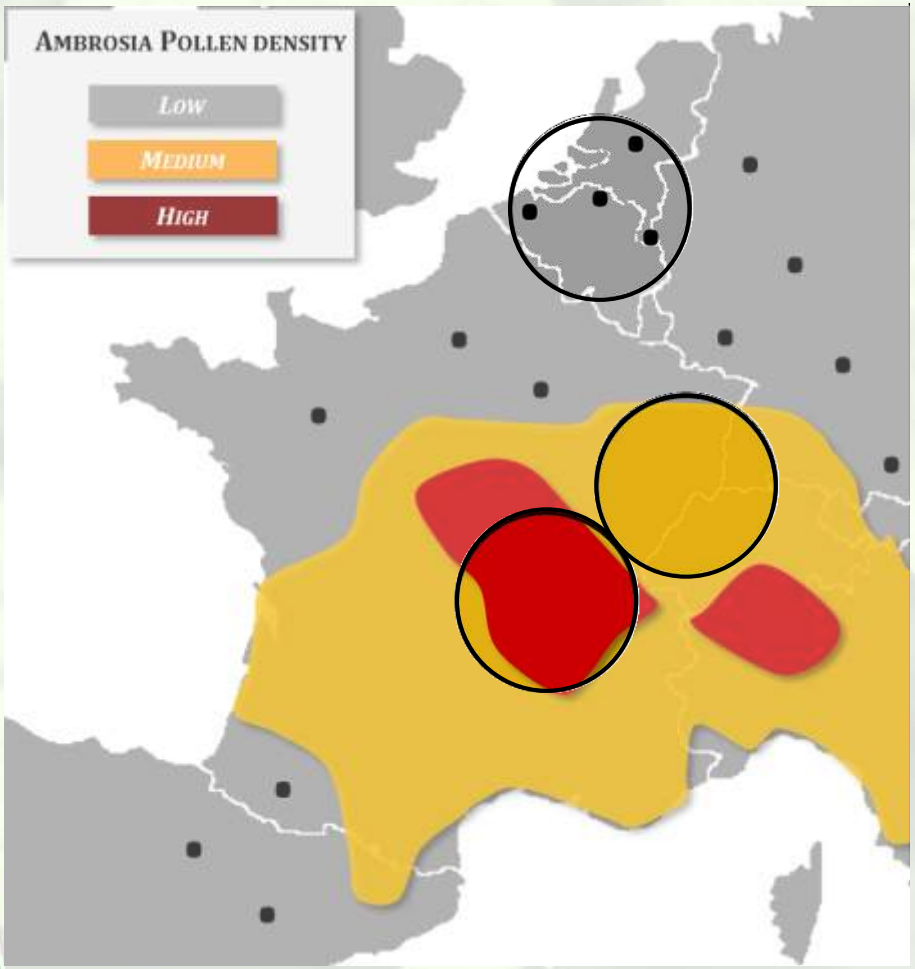

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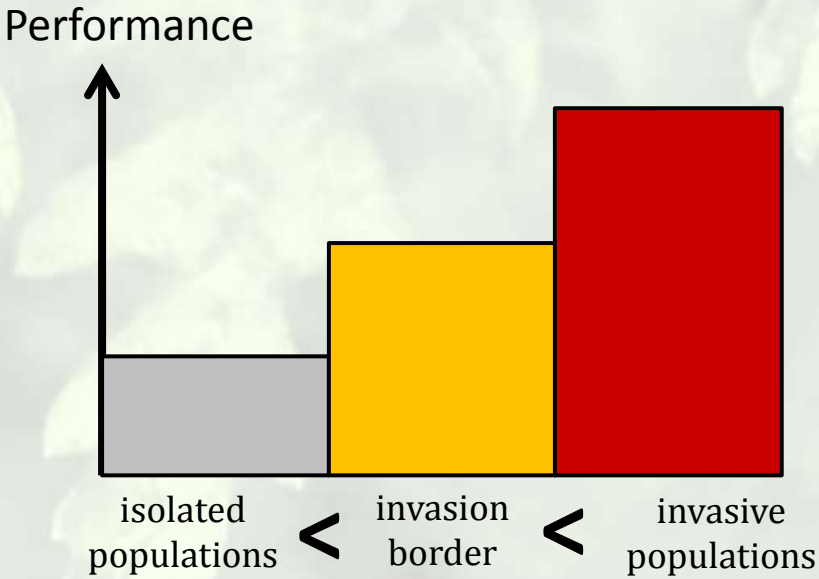
Performances comparisons

1) Stable invasion area



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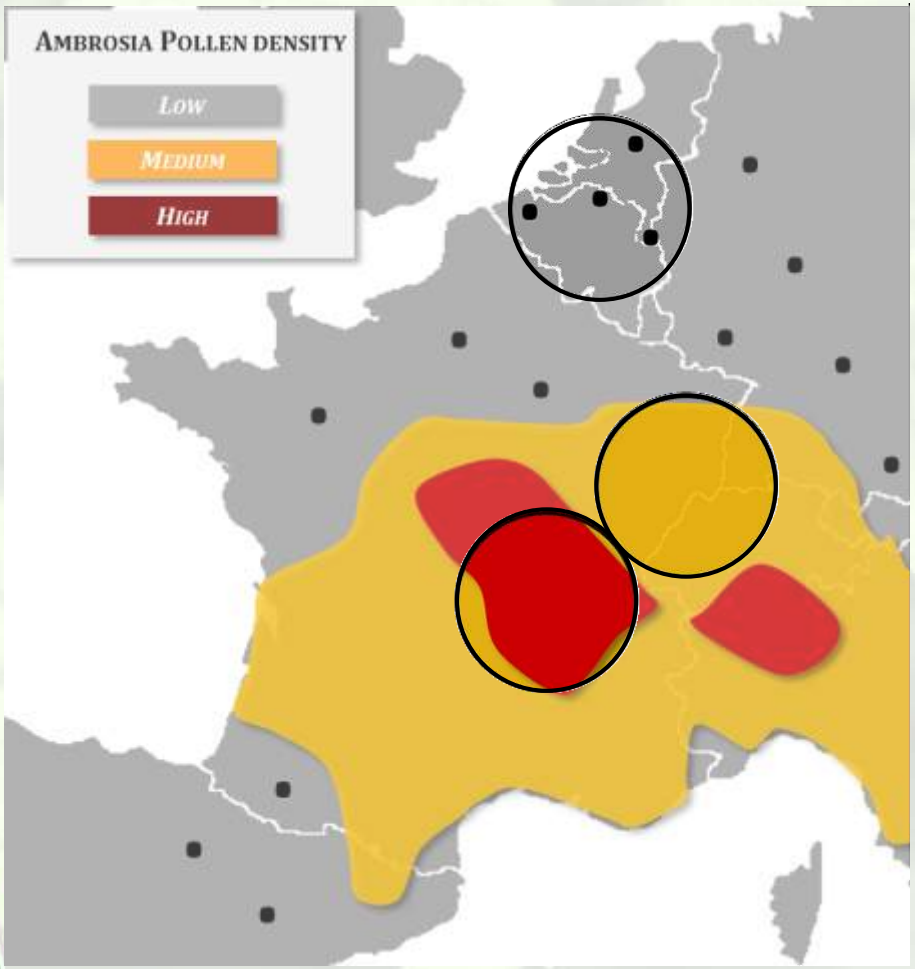

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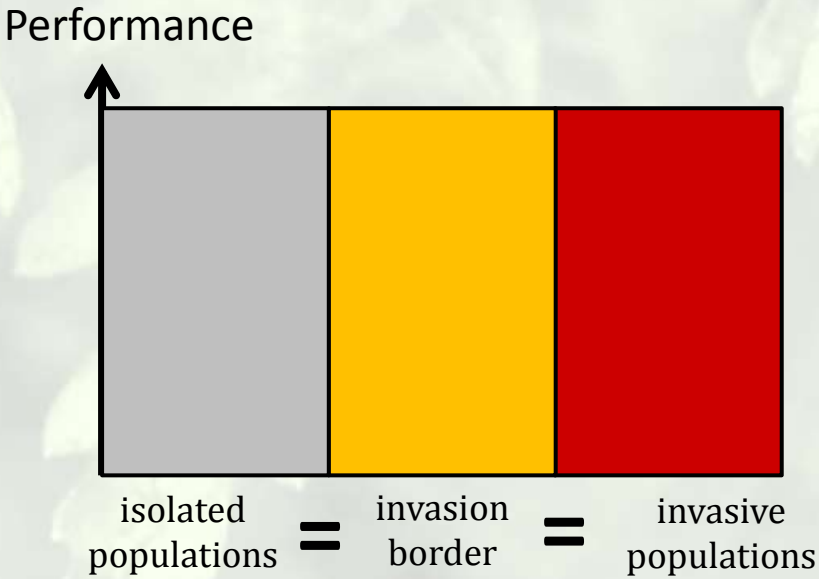
2) Invasion area expansion



Compare performances of *A. artemisiifolia* populations, from different invasion zones, in Western Europe.

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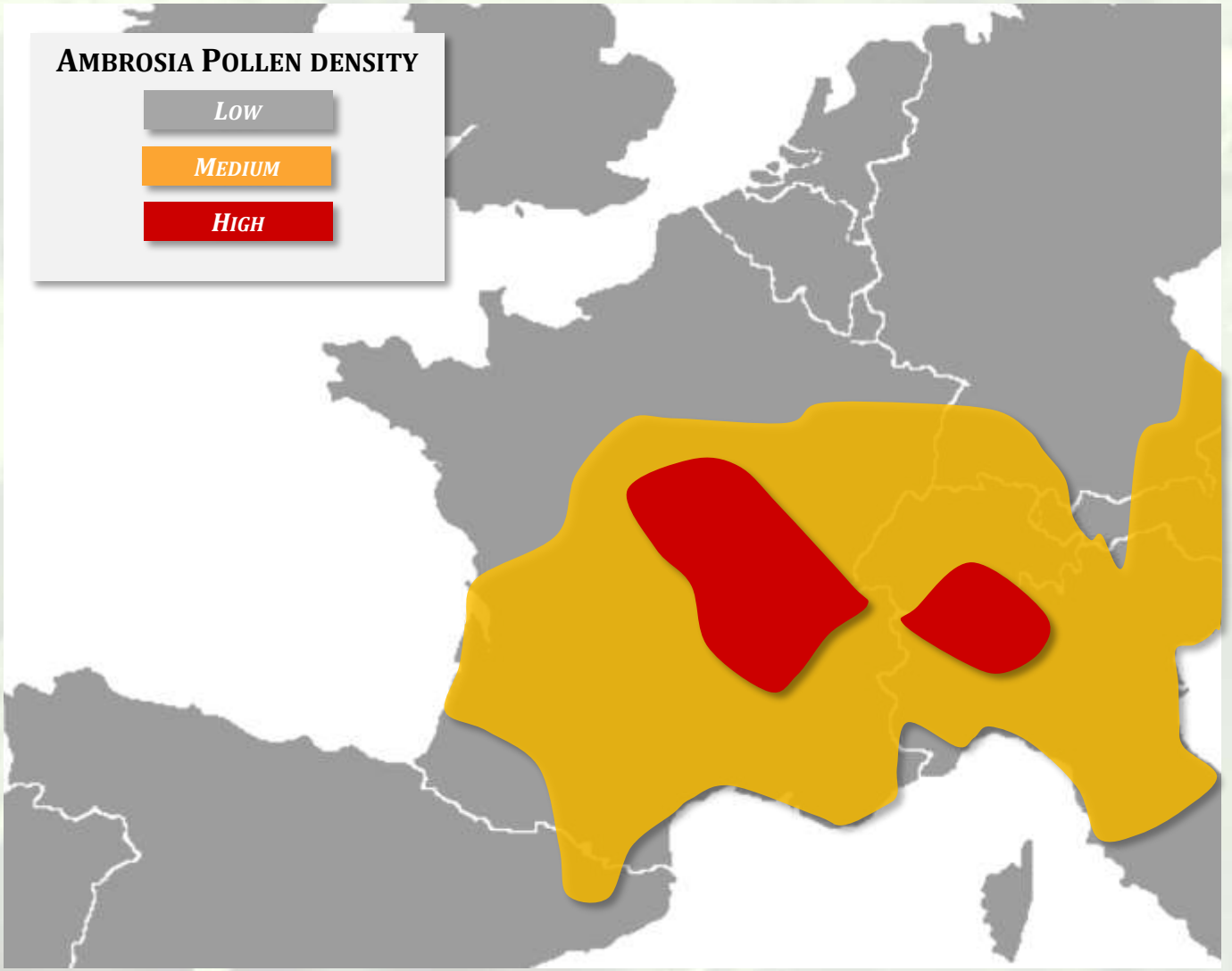

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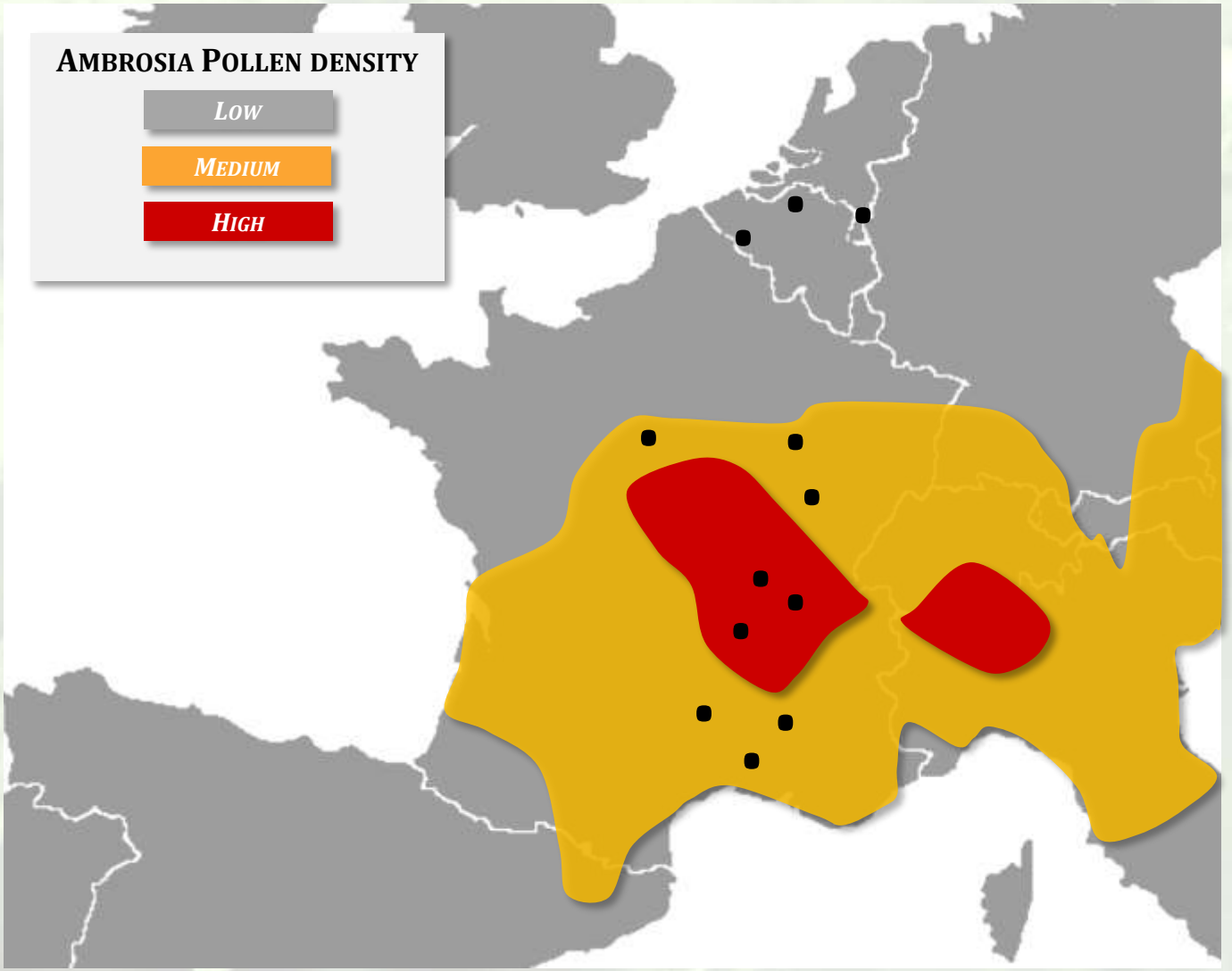

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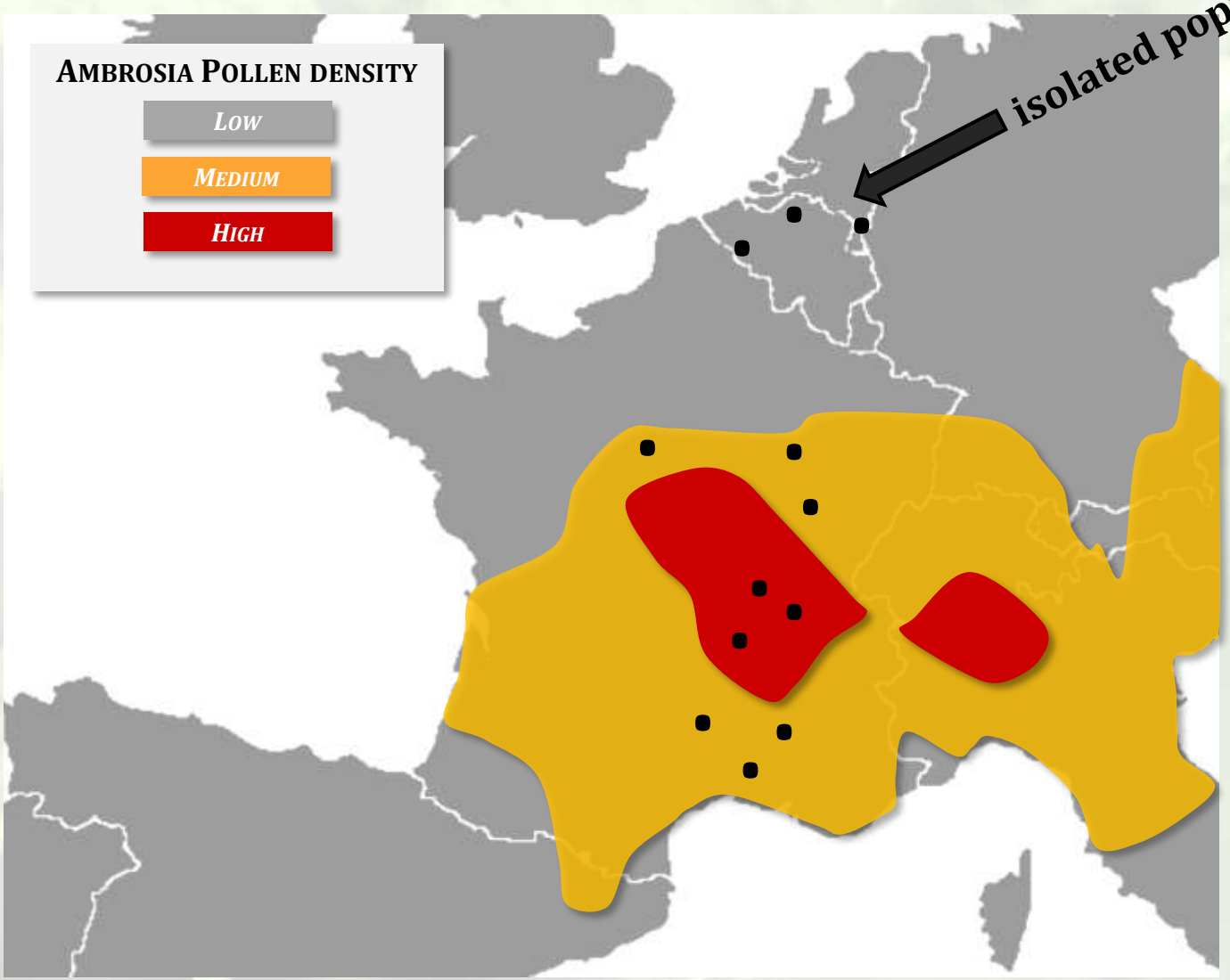

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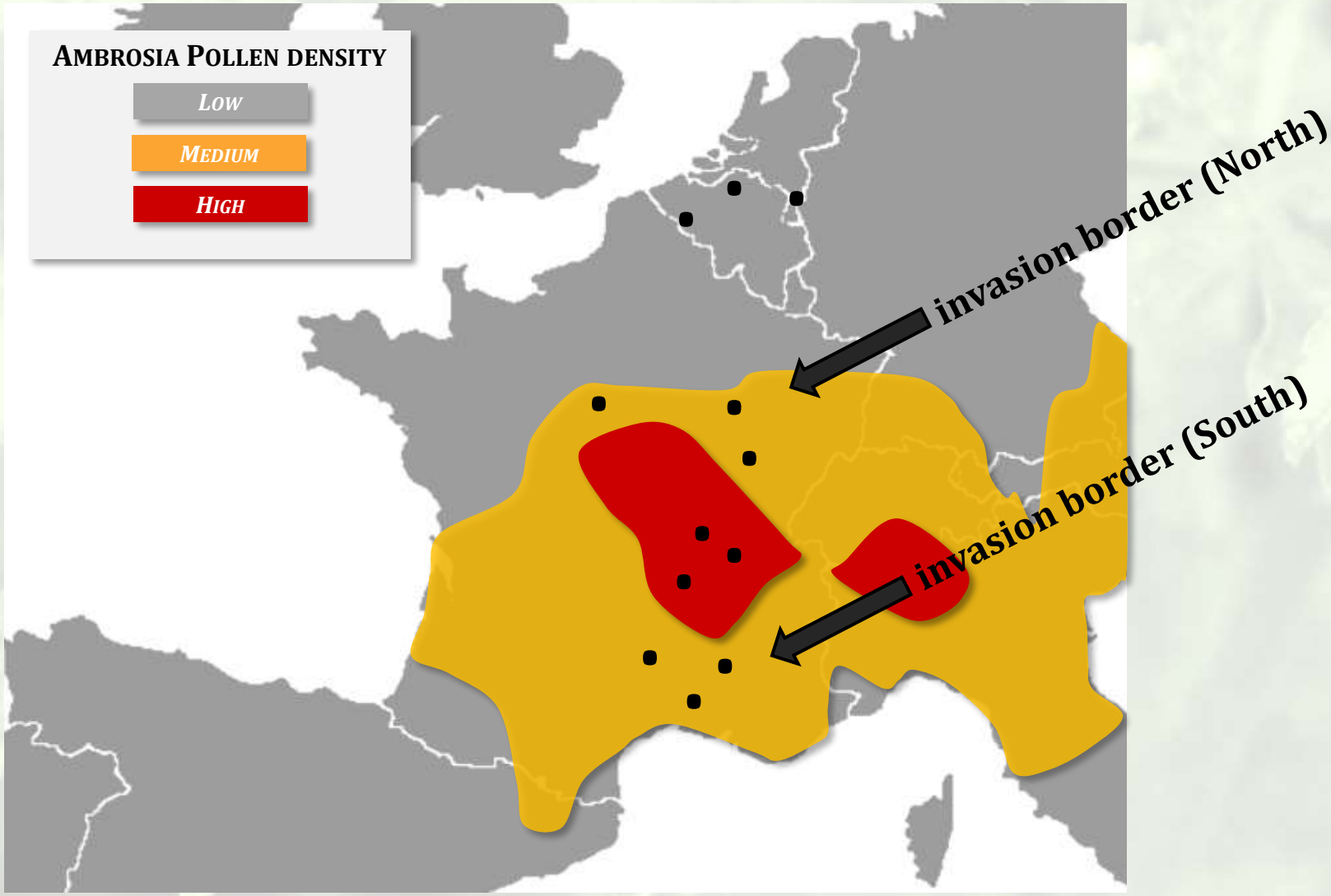

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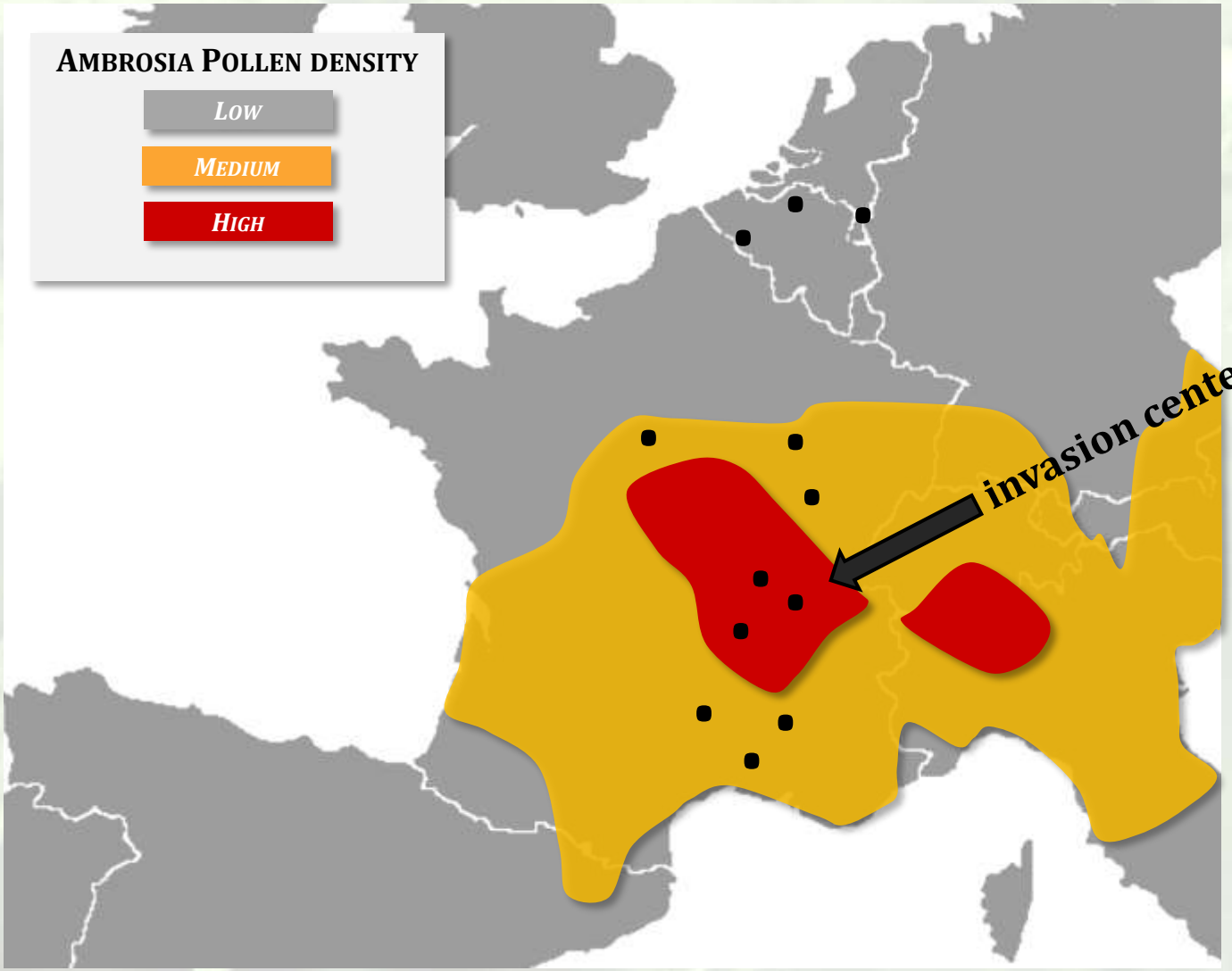

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- **Sampling Design**
  - Ruderal Habitats

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Merksem (BE)

Ramière (FR)

- **Sampling Design**
  - Two measurement campaigns

- **Sampling Design**
  - ➢ Two measurement campaigns
    - ▪ Summer field Campaign

- **Sampling Design**
  - Two measurement campaigns
    - Summer field Campaign
    - Autumn field Campaign

- **Sampling Design**
  - Summer Field Campaign

20 plants *x 3 populations x 4 zones of invasion*

- **Sampling Design**
  - Summer Field Campaign

20 plants *x 3 populations x 4 zones of invasion*

✓ *Above ground biomass* ➔ Growth performance

- **Sampling Design**
  - ➢ Summer Field Campaign

20 plants *x 3 populations x 4 zones of invasion*

✓ *<u>Above ground biomass</u>*

- **Sampling Design**
  - Summer Field Campaign

20 plants *x 3 populations x 4 zones of invasion*

- ✓ *Above ground biomass*
- ✓ *Specific Leaf Area*

➔ Response to environmental stress

- **Sampling Design**
  - ➢ Summer Field Campaign

20 plants *x 3 populations x 4 zones of invasion*

- ✓ *Above ground biomass*
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- **Sampling Design**
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20 plants *x 3 populations x 4 zones of invasion*

- ✓ *Above ground biomass*
- ✓ *Specific Leaf Area*
- ✓ *Competition*

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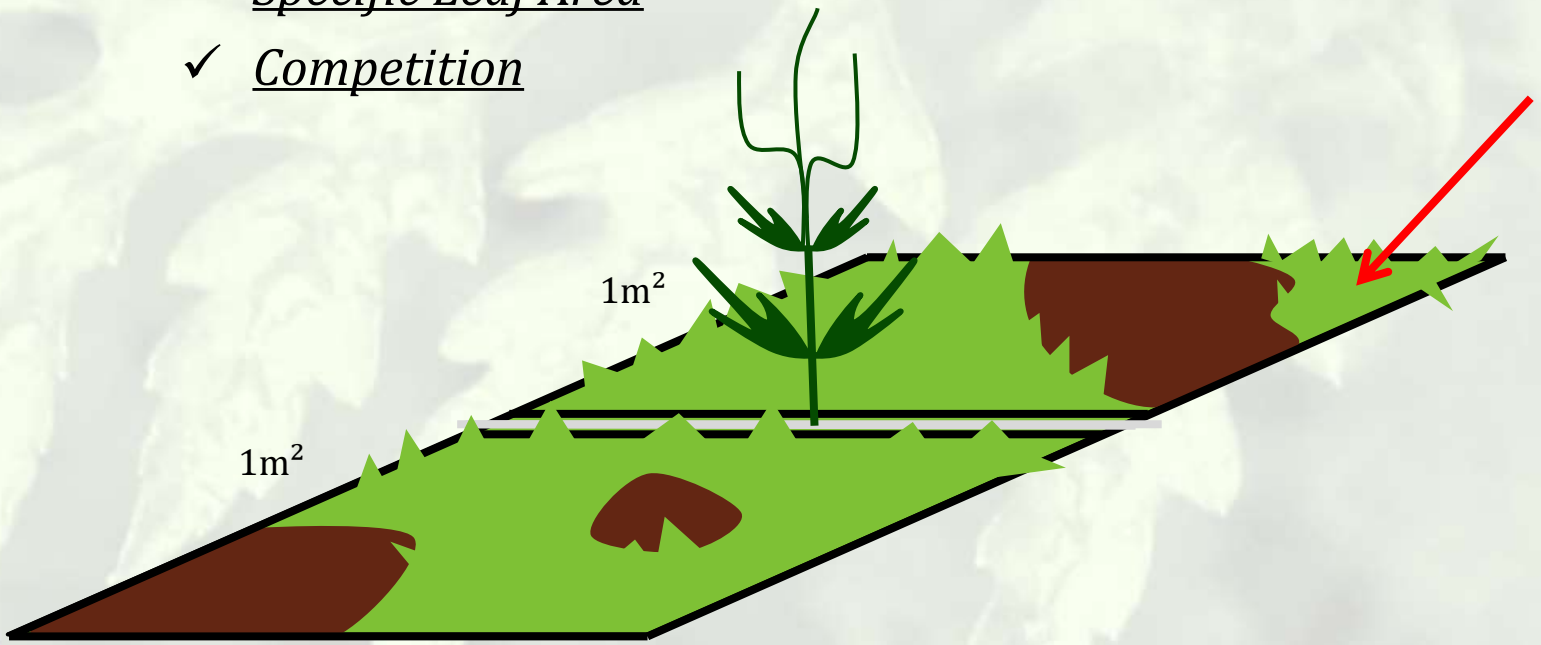

Biovolume of native flora = (native flora **cover**) x (mean **height**)

- **Sampling Design**
  - Autumn Field Campaign

25 plants *x 3 populations x 4 zones of invasion*

- **Sampling Design**
  - Autumn Field Campaign

25 plants *x 3 populations x 4 zones of invasion*

✓ *Seed production* ➔ Reproductive performance

- **Sampling Design**
  - ➢ Autumn Field Campaign

25 plants *x 3 populations x 4 zones of invasion*

✓ *Seed production*

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25 plants *x 3 populations x 4 zones of invasion*

- ✓ *Seed production*
- ✓ *% non-polinated seeds*

➔ Pollen limitation?

- **Sampling Design**
  - ➢ Autumn Field Campaign

25 plants *x 3 populations x 4 zones of invasion*

- ✓ *Seed production*
- ✓ *% non-polinated seeds*

→ Subset of 30 seeds by plants

- **Statistical analysis**
  - Generalized linear model for each field campaign

Model:

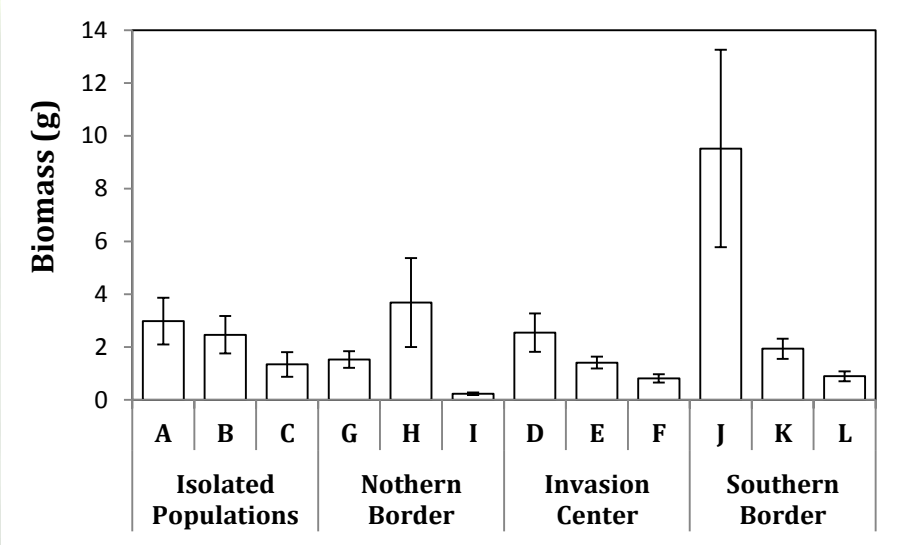
Factors	Type	Levels
Zone	Fixed	4
Population (Zone)	Random	12

→ Competition as covariate (Summer data)

Results

- **Above ground biomass**

Source of variation	Biomass		
	df	F	p
Competition	1	0,36	0,550
Invasion Zone	3	0,77	0,541
Population (Invasion Zone)	8	5,41	**<0,001**
Error	221	-	-



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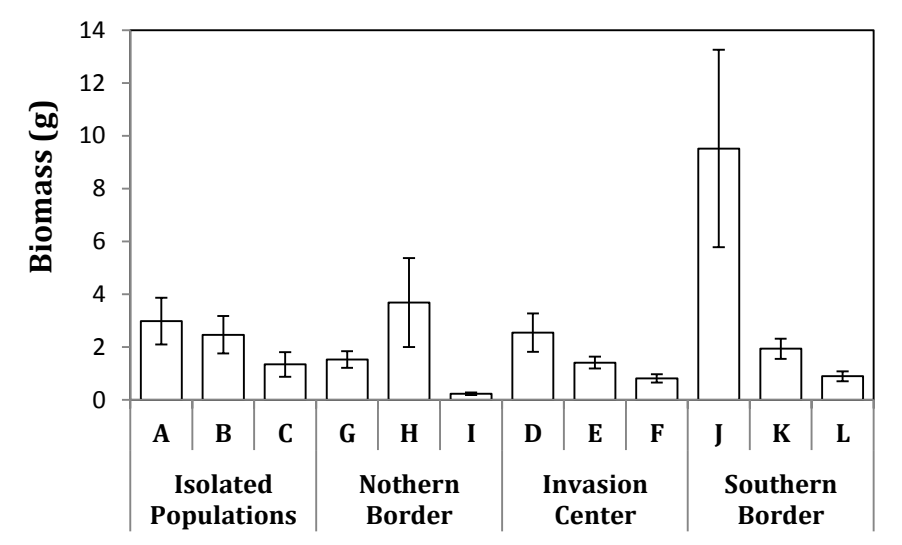

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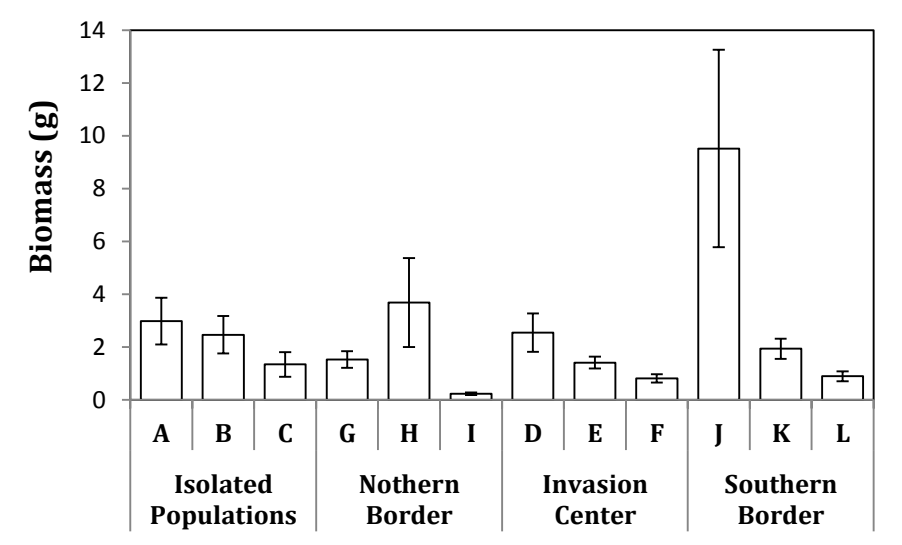

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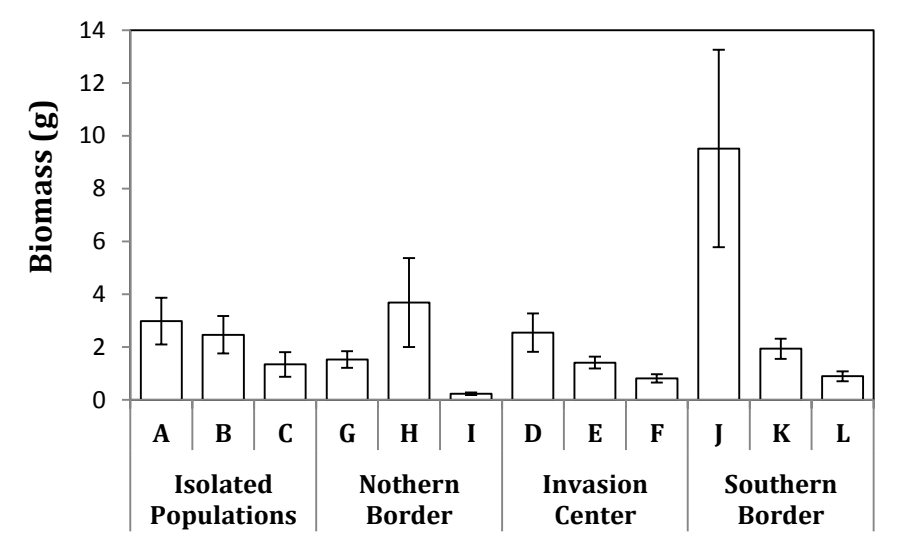

- **Specific leaf Area**

	SLA		
Source of variation	**df**	**F**	**p**
Competition	1	43,97	**<0,001**
Invasion Zone	3	2,27	0,157
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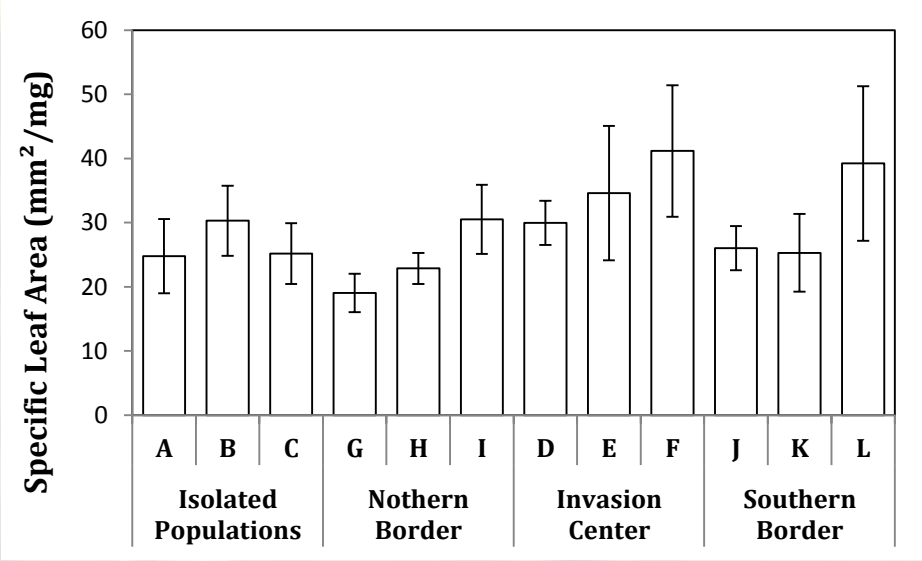

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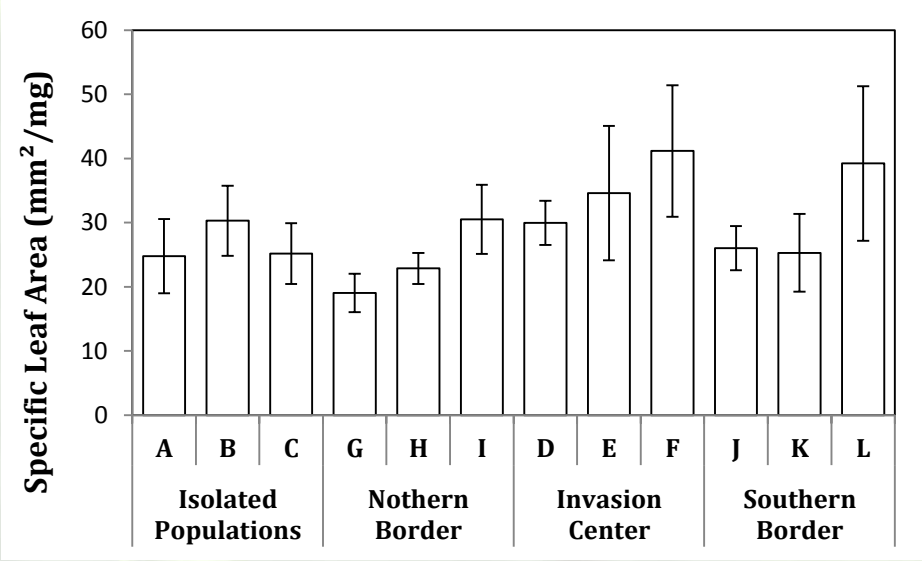

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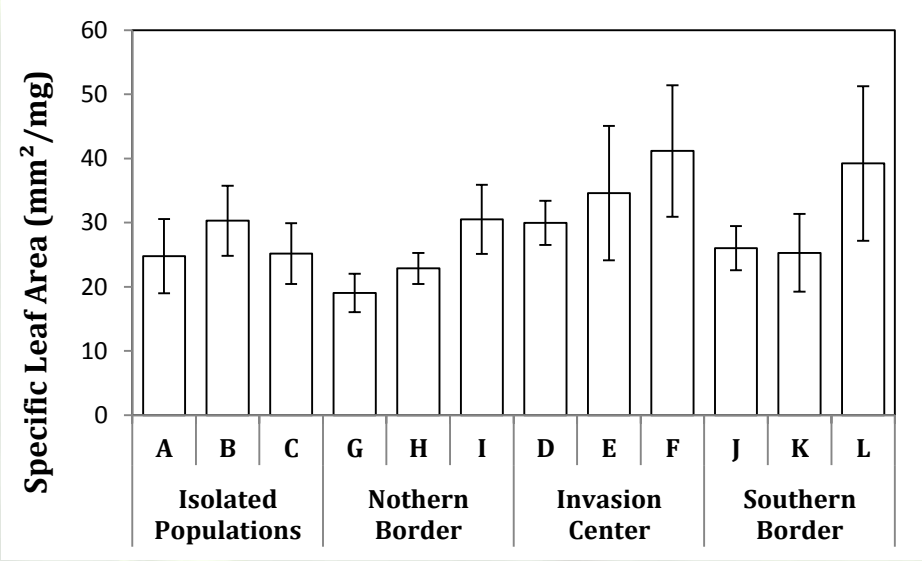

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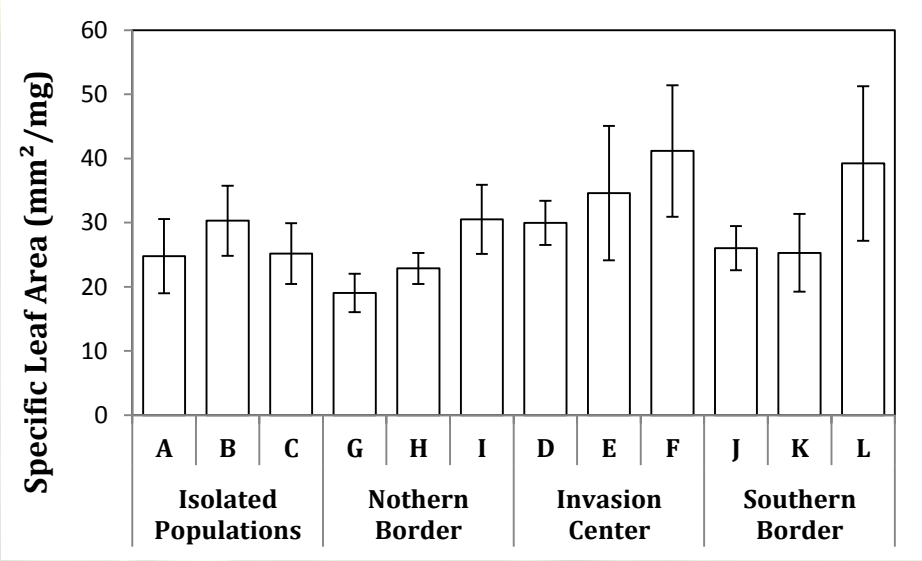

- **Seed production**

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Source of variation	**df**	**F**	**p**
Invasion Zone	3	0,40	0,759
Population (Invasion Zone)	8	9,68	**<0,001**
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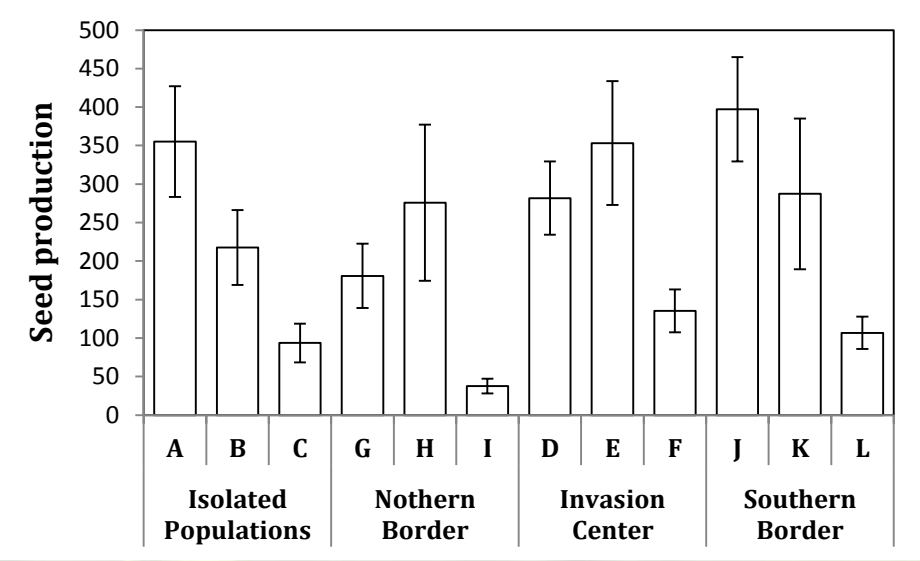

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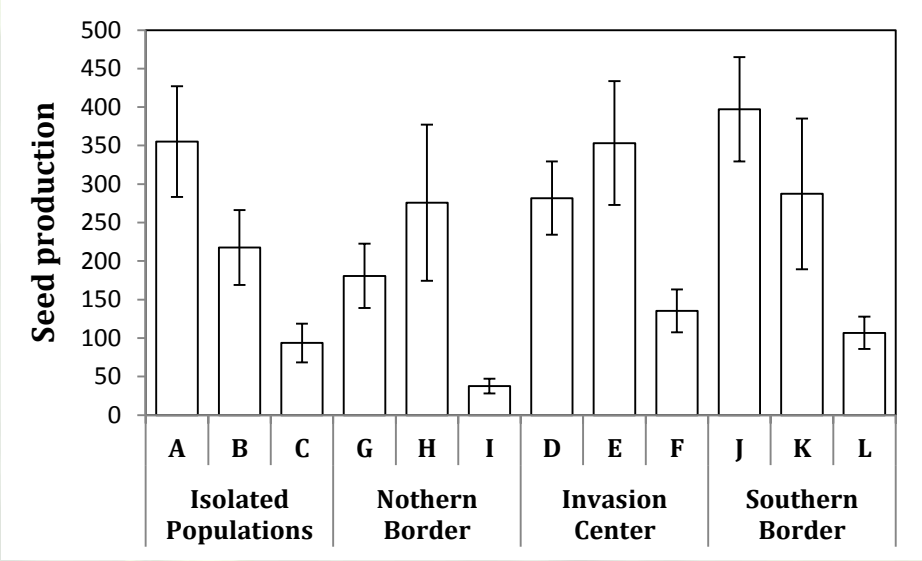

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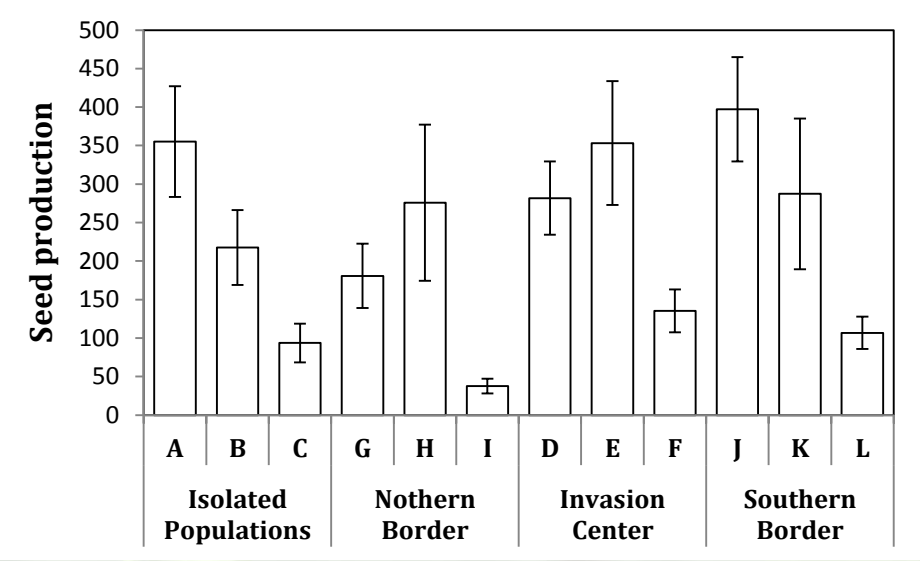

- **Amount of non-pollinated seeds (%)**

	Non-polinated seeds		
Source of variation	**df**	**F**	**p**
Invasion Zone	3	1,02	0,434
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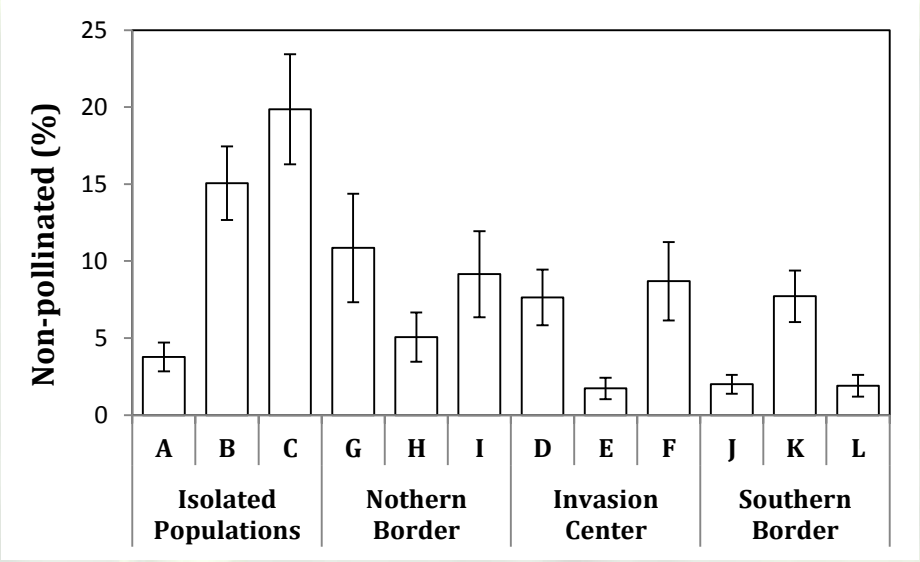

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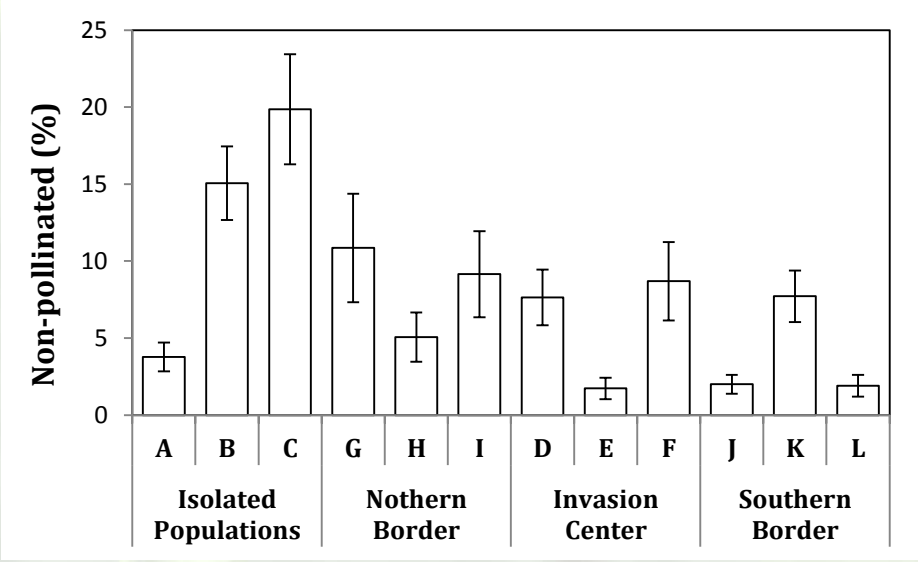

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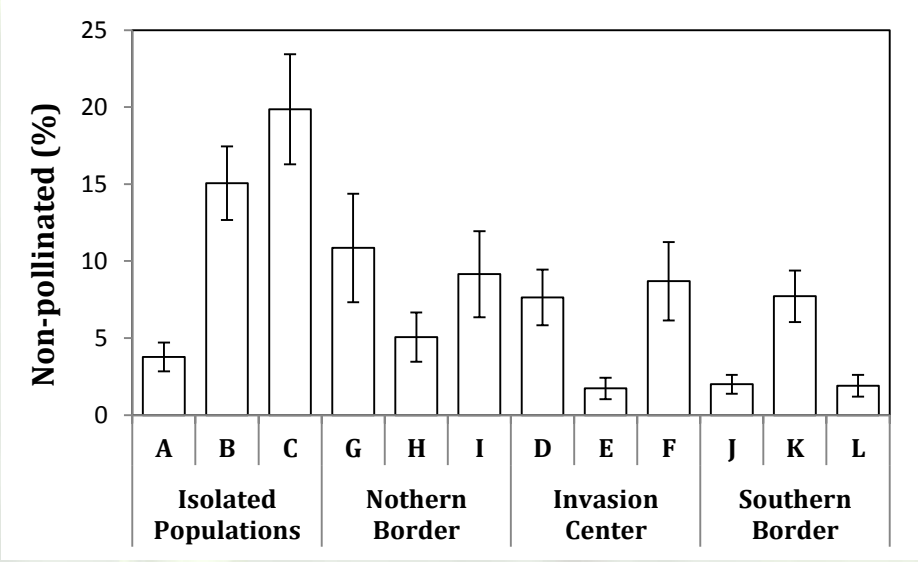

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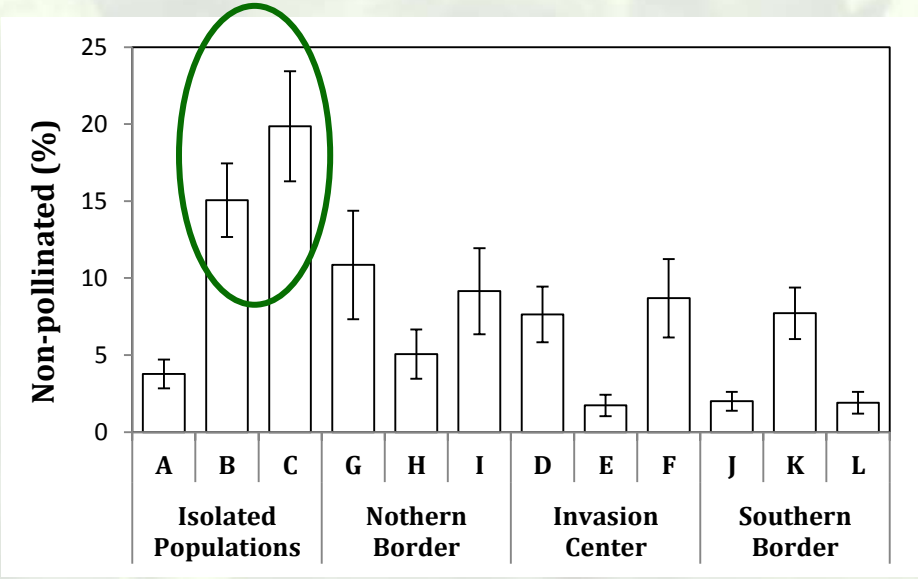

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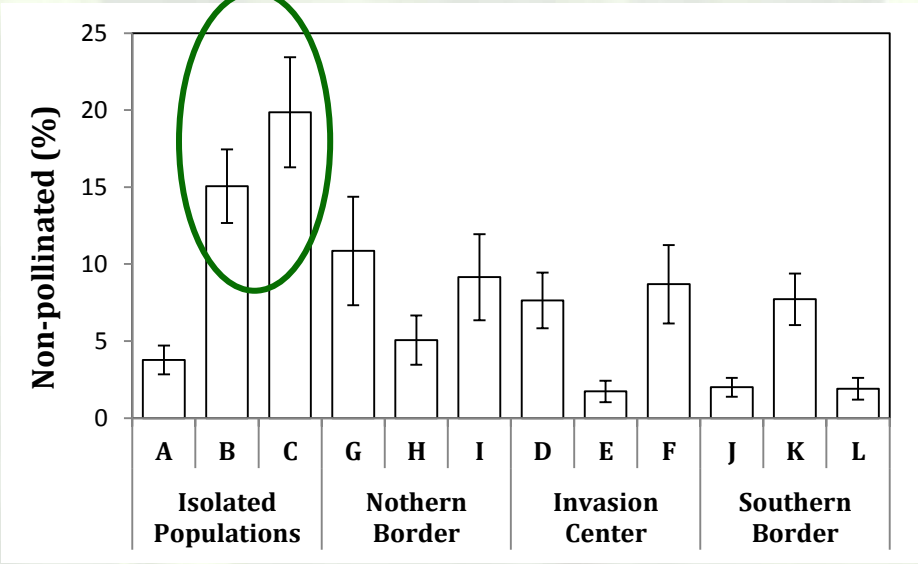
Error	288	-	-

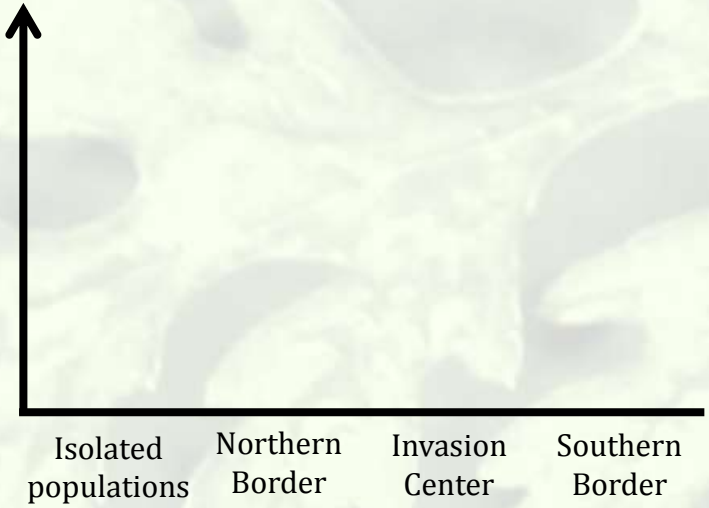
Pollen limitation ?



- **Summary**

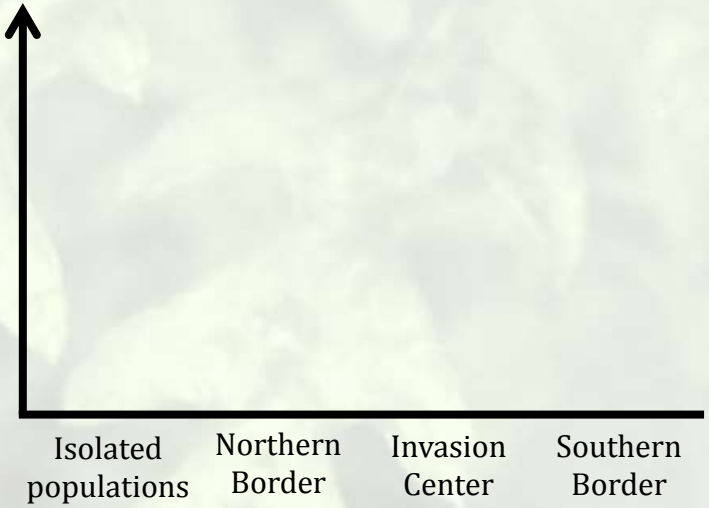
1) Stable invasion area

Performances



2) Invasion area expansion

Performances



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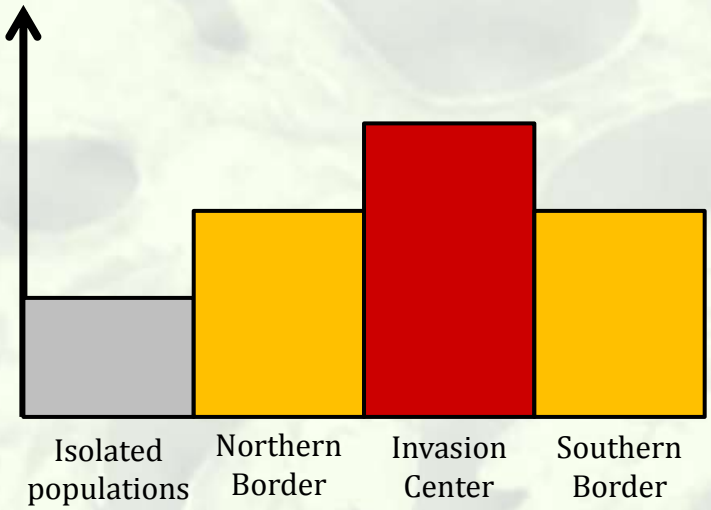

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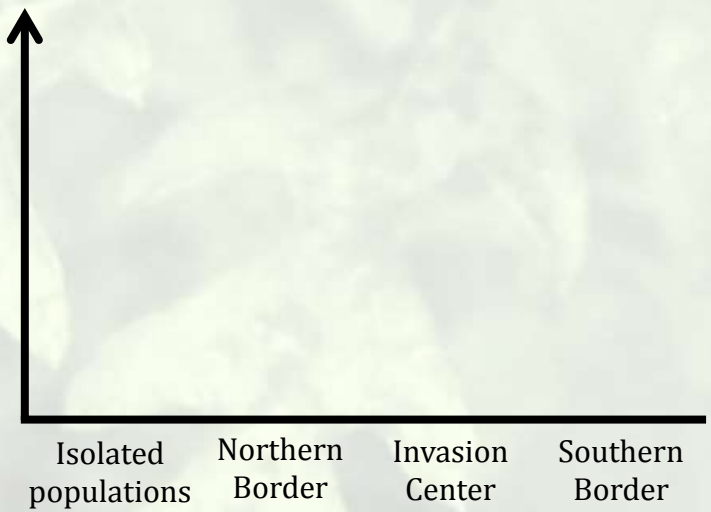

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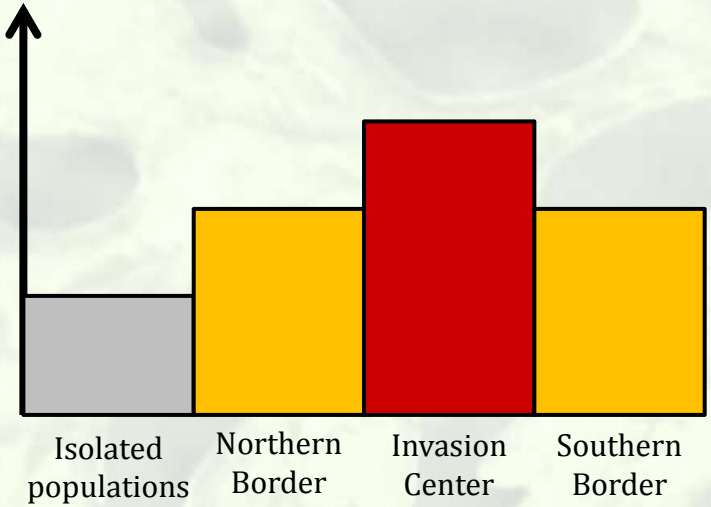
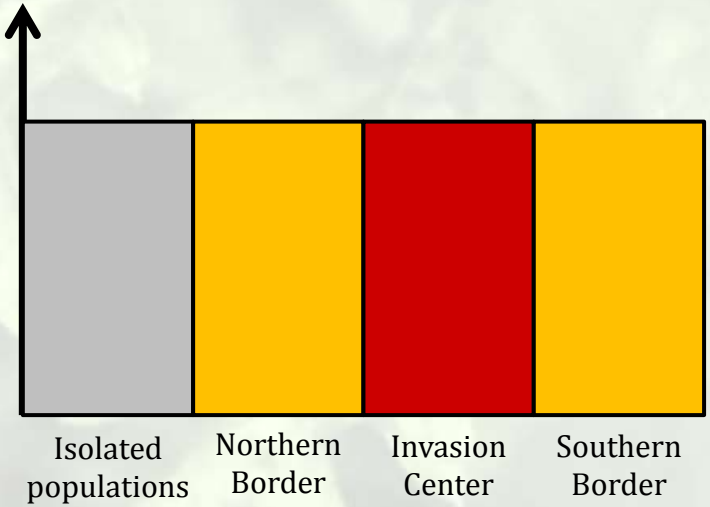


2) Invasion area expansion

Performances



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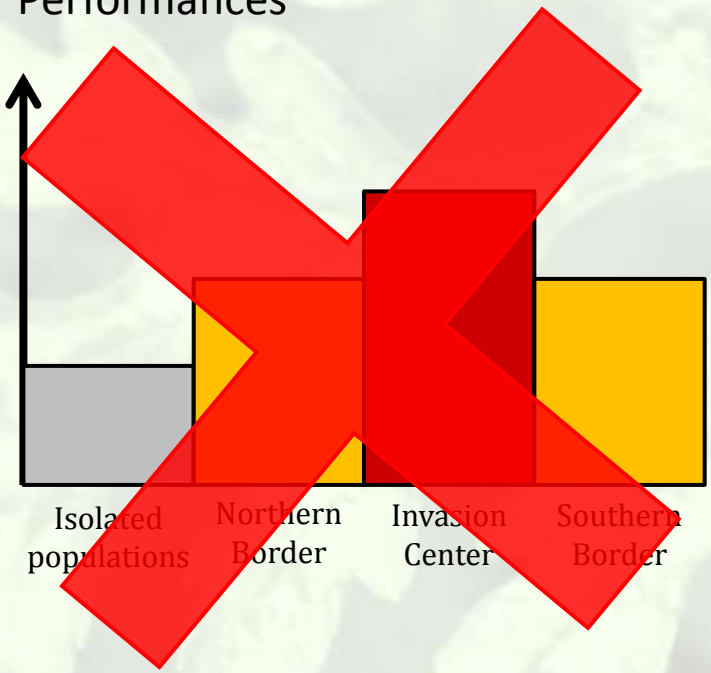

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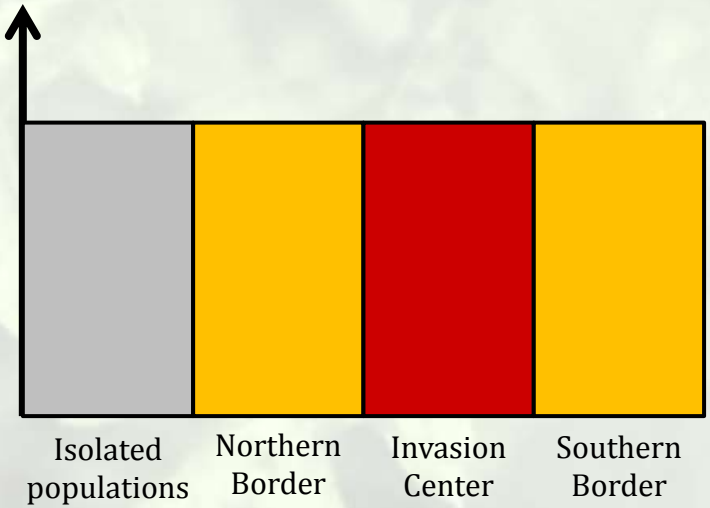
Performances



Conclusion

- **No performance variation**
  - Isolated populations have the same performance than others
    - → No limitation by environmental conditions
    - → Invasion potential in the North

- **Small scale survey in 2007**
  - Only three populations were found in Belgium…

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    → Inefficient detection ?

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→ Inefficient detection ?

And/or

→ Other limiting factors ?

- **Early detection is the key !**
  - The species has to be monitored

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- **Early detection is the key !**
  - ➢ The species has to be monitored
  - ➢ Agricultural habitat cannot be neglected !
    - → Risk linked to new cultivated species

- **Acknowledgements**

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  - COST SMARTER
    - Short Term Scientific Mission

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  - The other authors

Thank you for your attention!

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