



# Susceptibility of different provenances of birch in Iceland to *Heringocrania unimaculella*

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# Downy birch

## *Betula pubescens*

- The only native forest forming species in Iceland
- Birch forest and woodland covered 25-40% of Iceland's land area around 870
- Today the cover is about 1.5 %
- An important tree species in Icelandic forestry

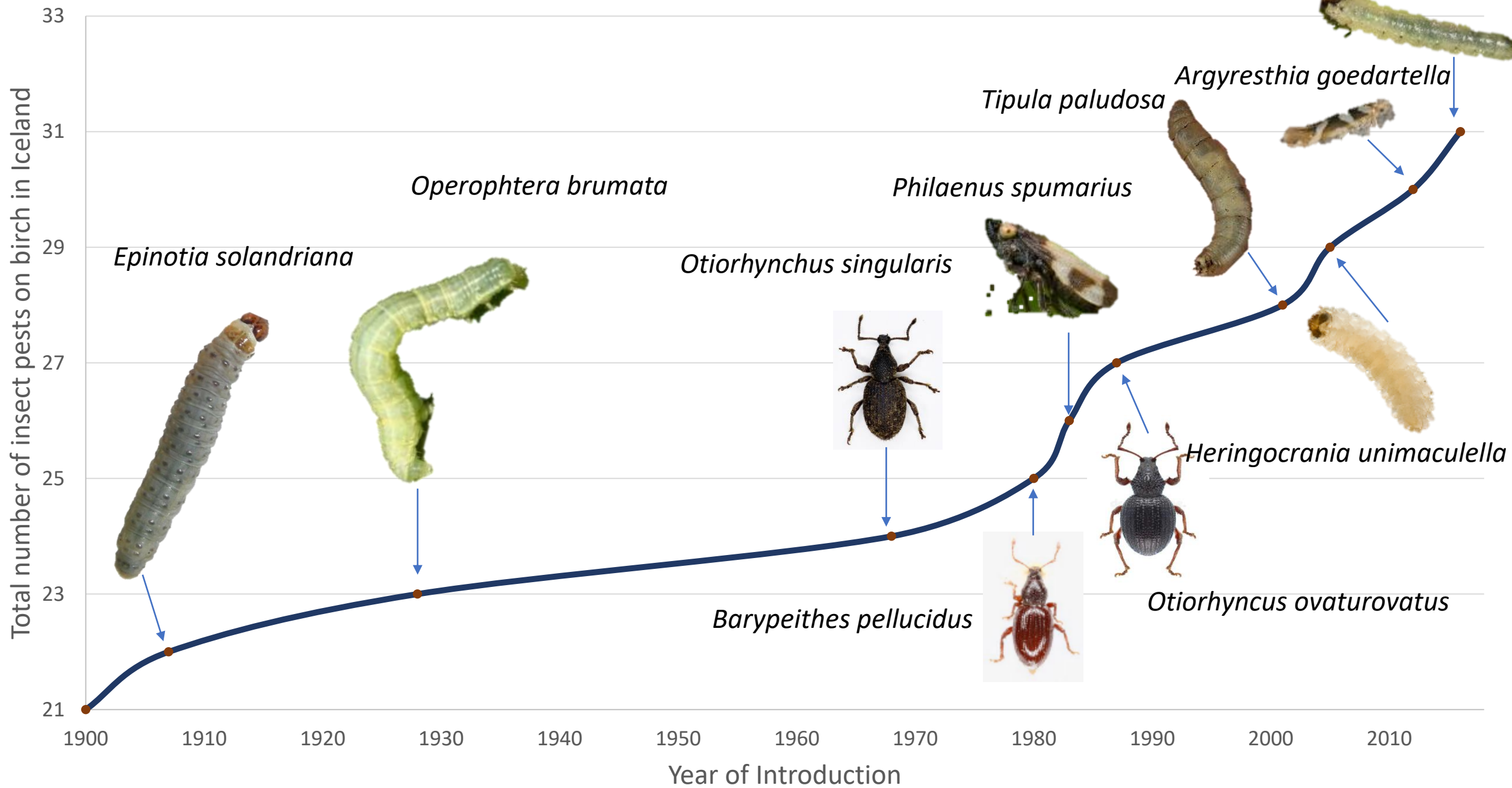


# Insect herbivores birch in Iceland

- A total of 80 insect pests species are found on woody plants in Iceland
- 31 found on birch
  - 21 native (before 1900)
  - 10 introduced (after 1900)



# Introduced insect pests on birch in Iceland from 1900

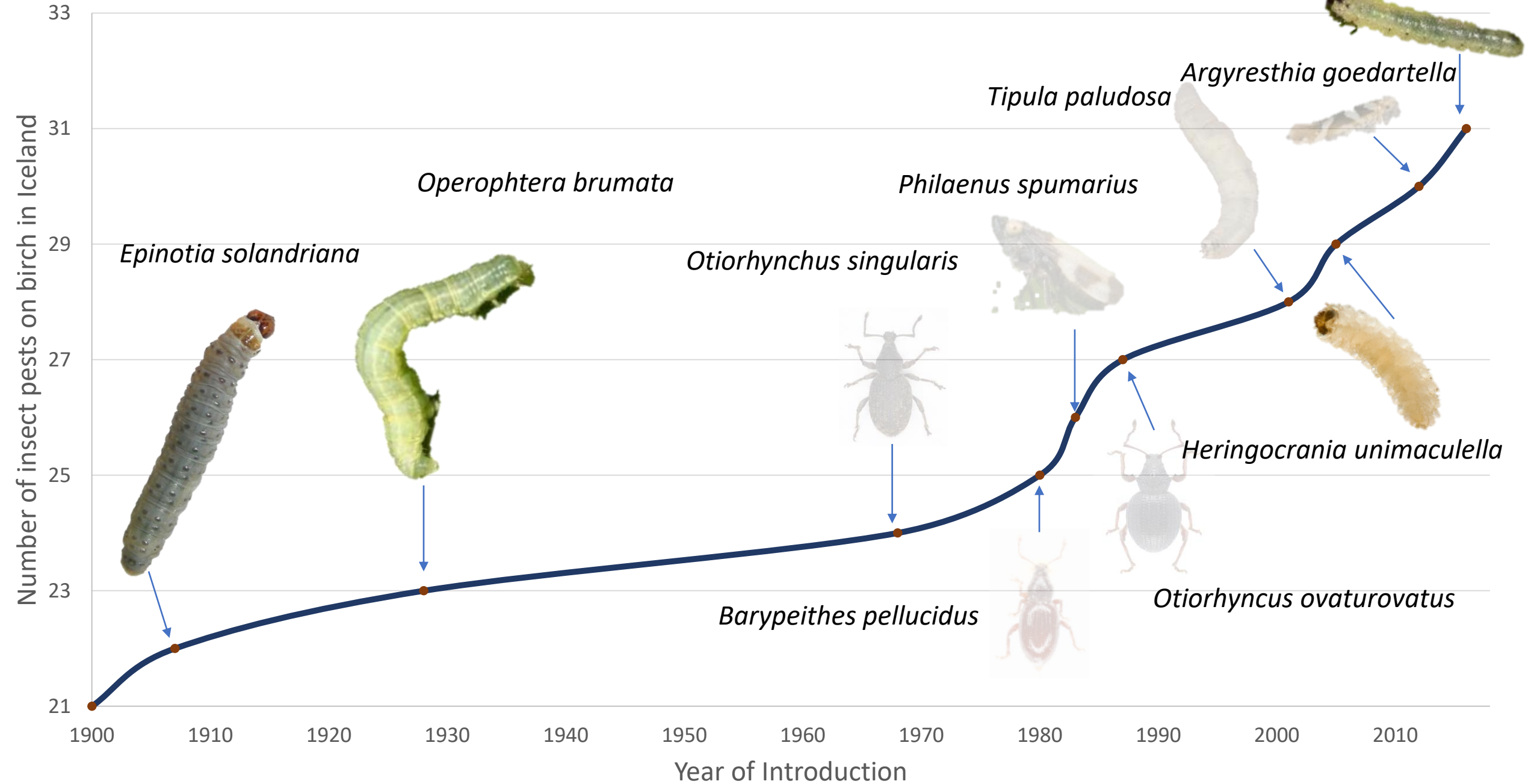


# Insect herbivores birch in Iceland

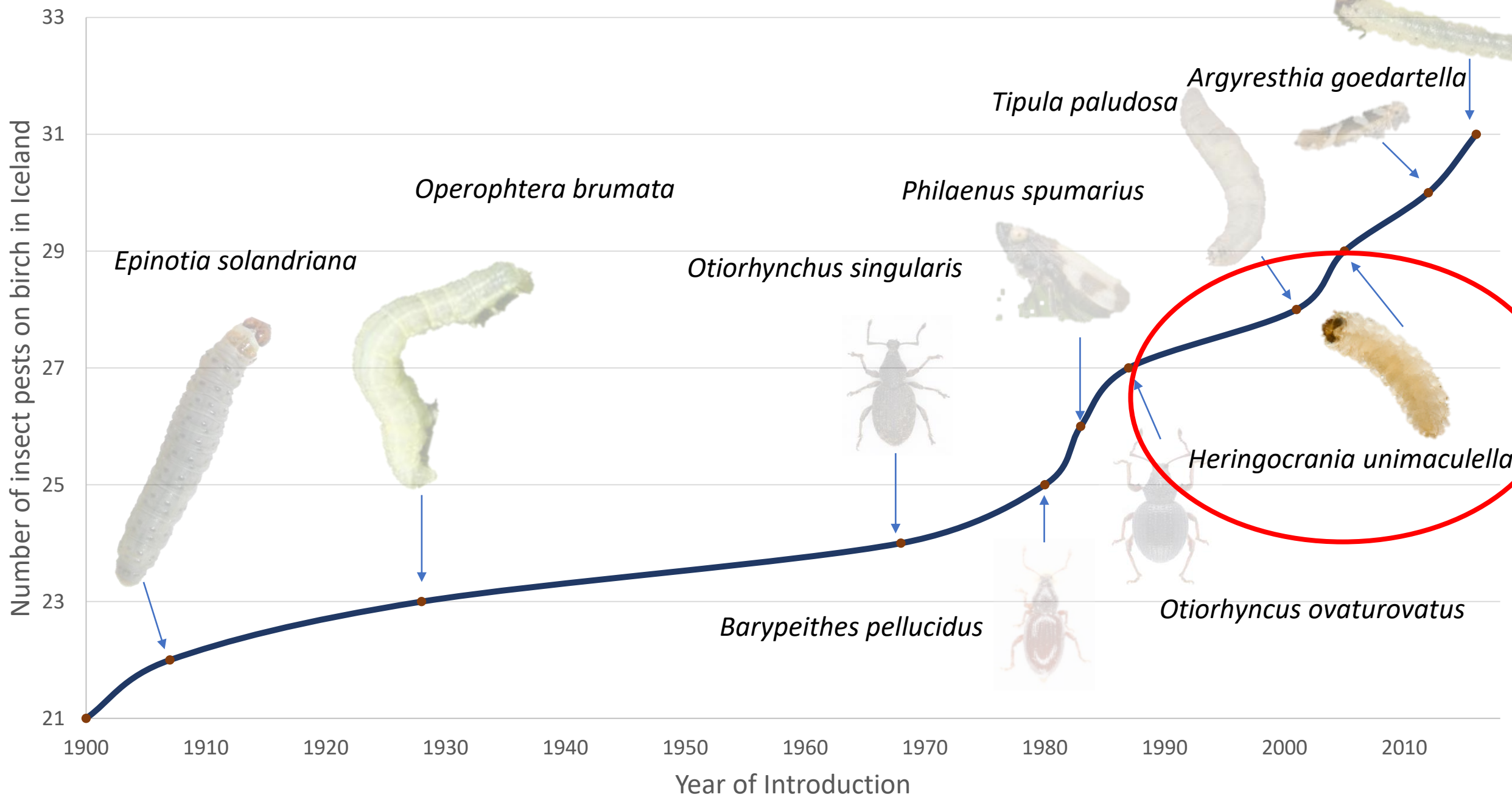
- Effects vary between insect species and years
  - **No or minor damage:** Only visible damage
  - **Moderate damage:** Tree growth and vigor
  - **Serios damage:** Tree death



# Introduced invasive insect pests on birch in Iceland from 1900

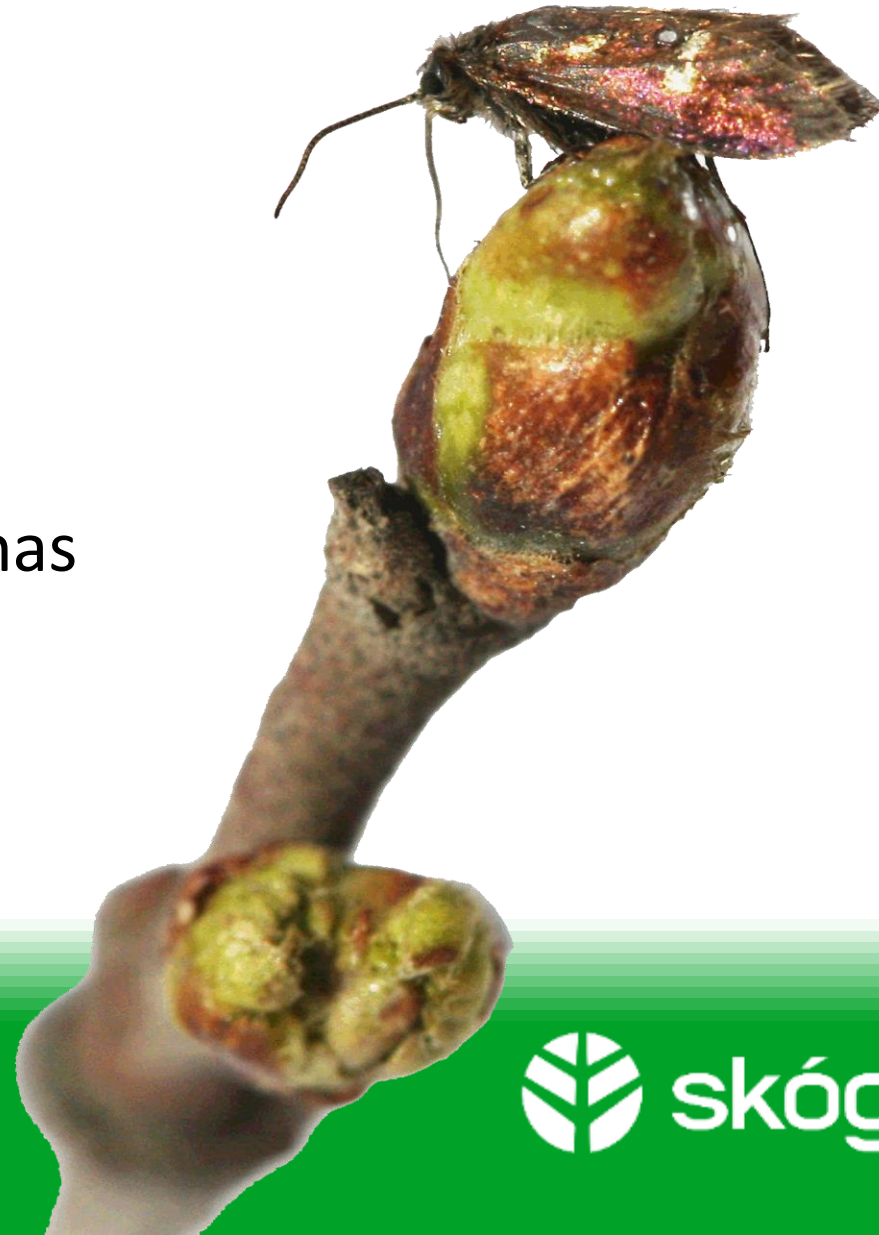


Introduced invasive insect pests on birch in Iceland from 1900

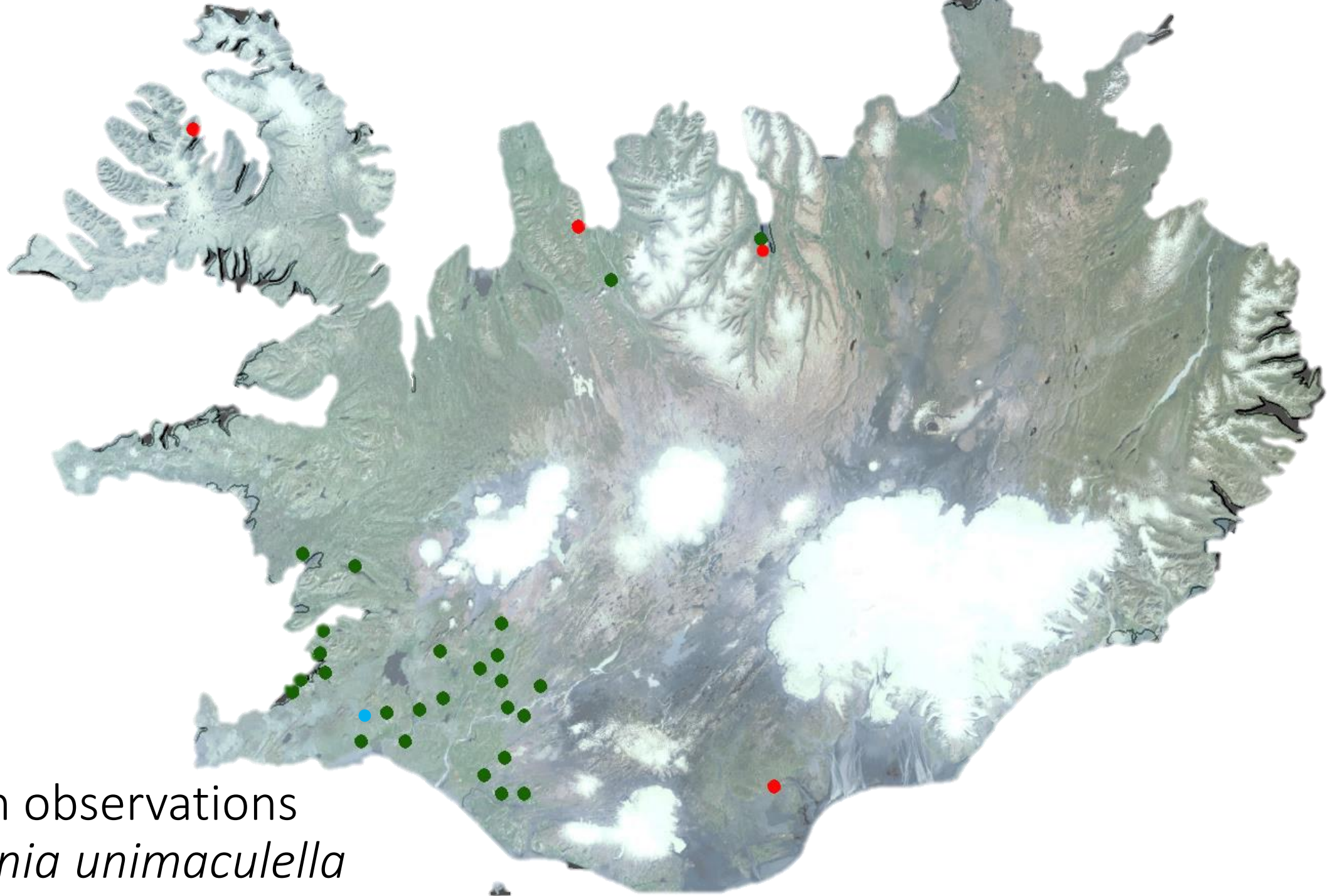


# *Heringocrania unimaculella*

- Small moth
- Larvae feeds inside birch leaves
- First recorded in Iceland in 2005
- Since then it's distribution area has been expanding







- 2005
- 2017
- 2019

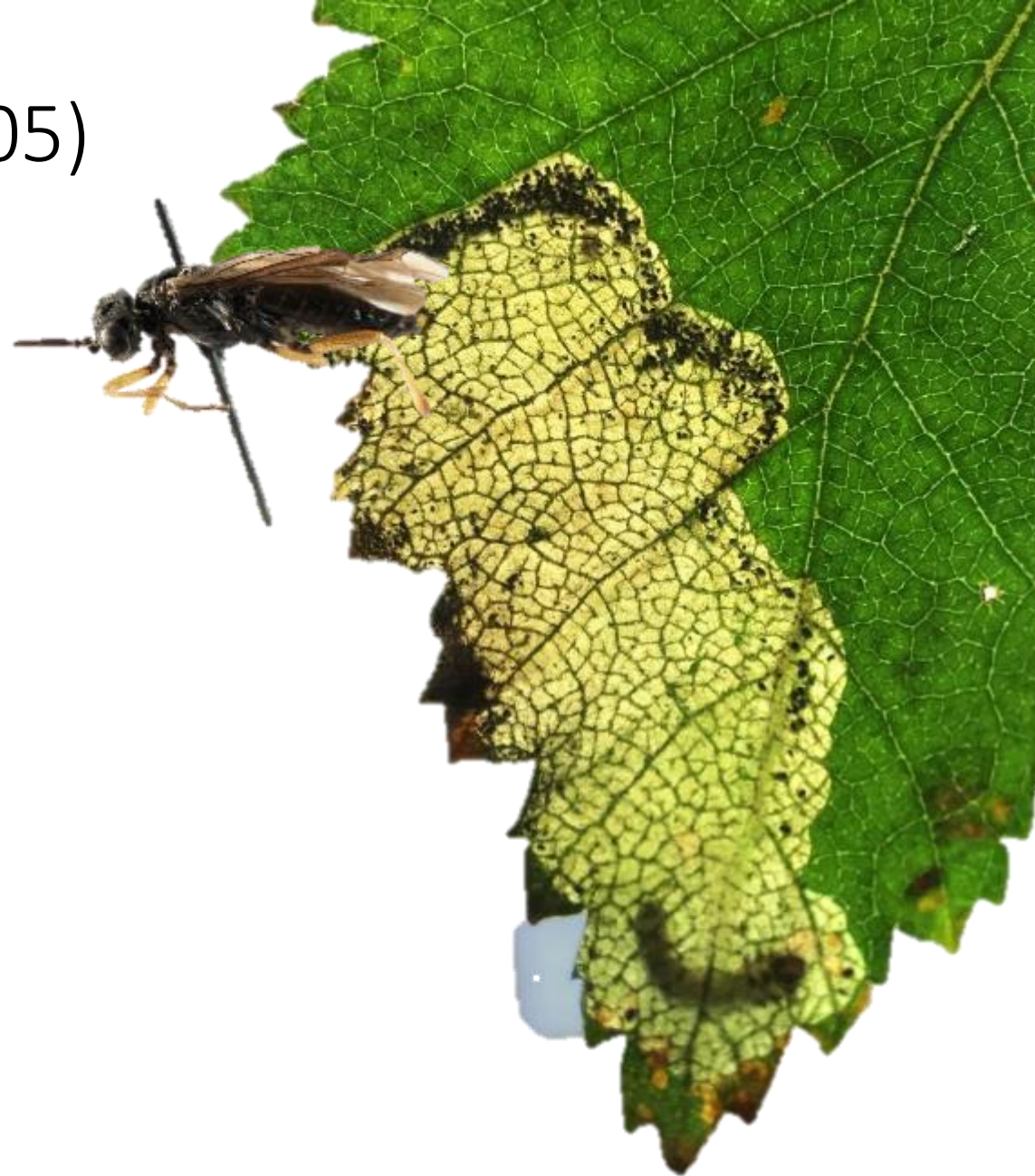
Distribution observations  
*Heringocrania unimaculella*

# *Heringocrania unimaculella*

- Adult emerge from soil in in spring (early April)
- Egg laying occurs right after bud burst
- Larvae mines inside of leaf until late June
- Causes blotch on leaves that later turn brown as the mining continues – changes appearance
- The first leafmining species on birch in Iceland



*Heringocrania unimaculella* (2005)



*Scolioneura betuleti* (2016)

*Heringocrania unimaculella* (2005)



*..two leafmining insects  
on birch in Iceland*



*Scolioneura betuleti* (2016)

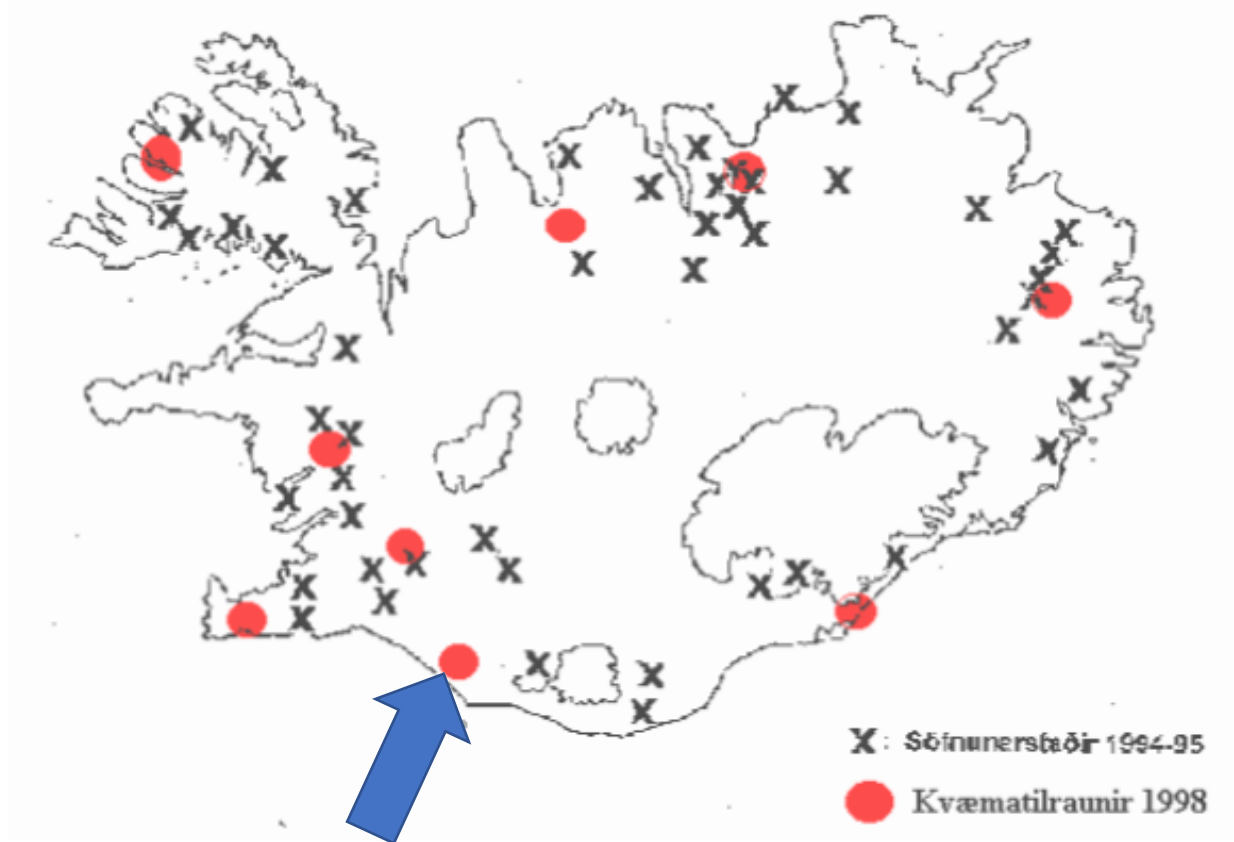


# *Effects of leafmining on birch*

- The effect on birch growth and vigor are not known
  - Is likely affecting the trees photosynthesis abilities
  - Increase susceptibility to other stresses?
  - Ecological impact on natural systems?

# Susceptibility of different provenances of birch in Iceland to *Heringocrania unimaculella*

- Started in 2017
- Birch trial in Varmidalur, South Iceland
  - Planted in 1998
- 42 different provenances measured
  - 5 blocks
  - 3150 birch plants
- Height of trees and damage on leaves were measured



Varmidalur

## Rating scale

0 → No damage

1 → 1-10% damage

2 → 10-25% damage

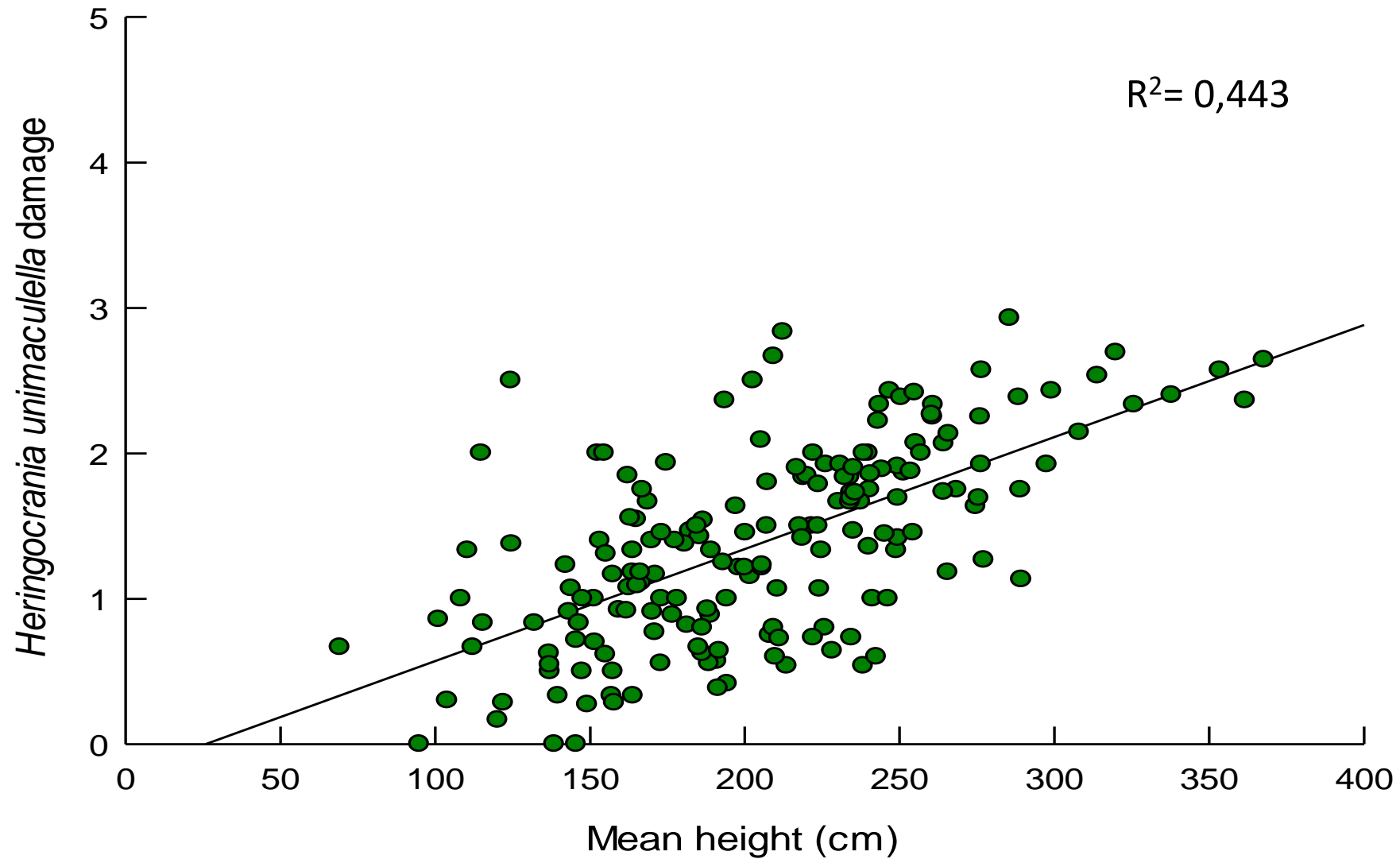
3 → 25-50% damage

4 → 50-75% damage

5 → 75-100% damage



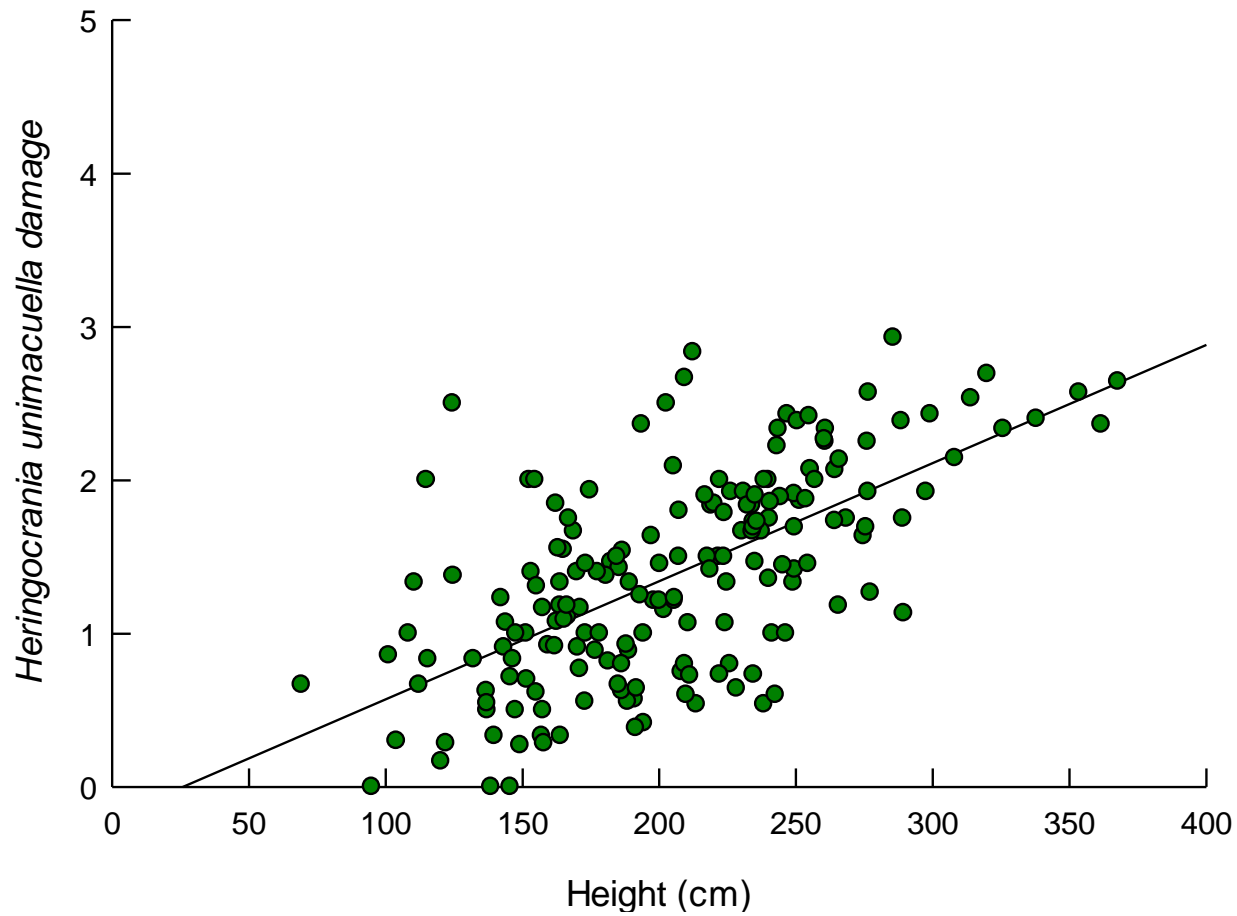
## The relationship between damage and mean height



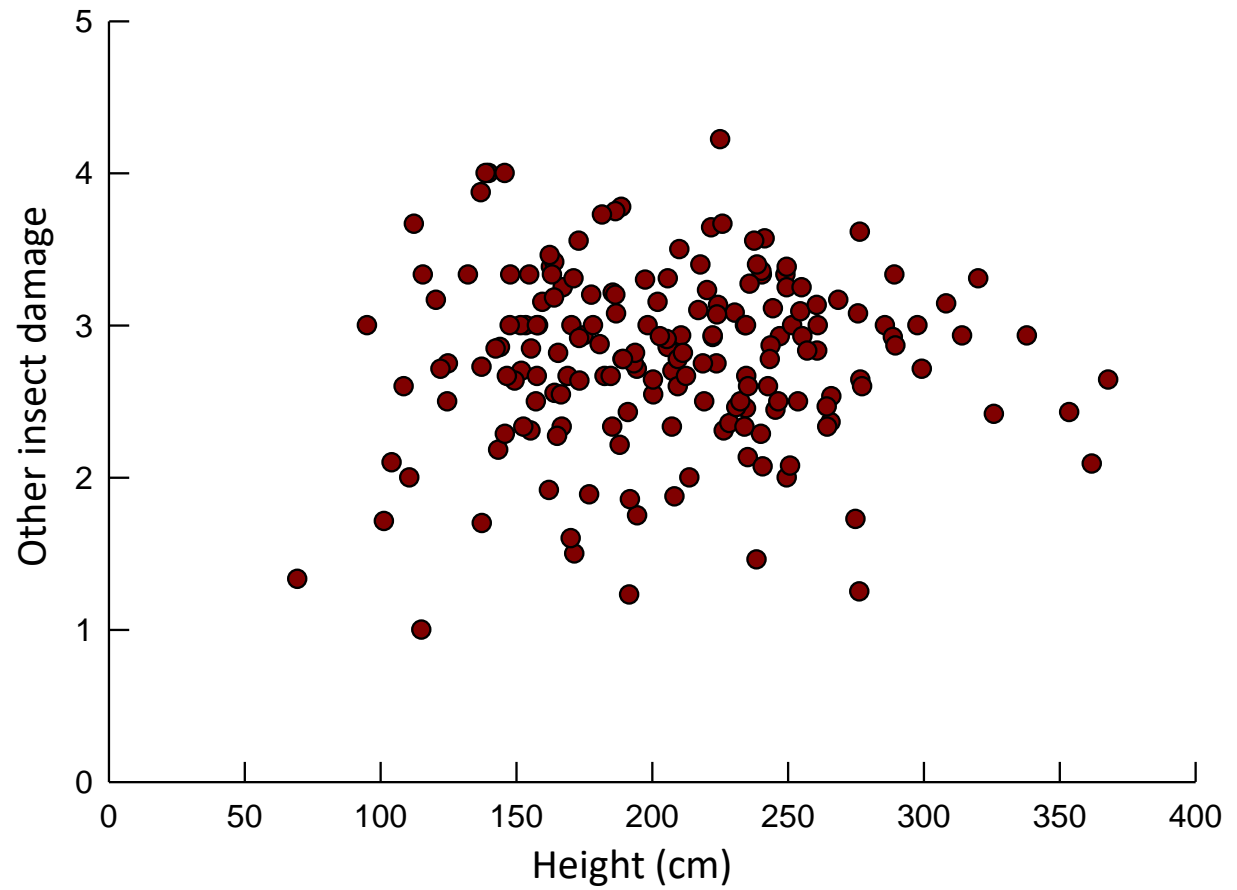
- *H. unimaculella* was first found in Varmidalur in 2017



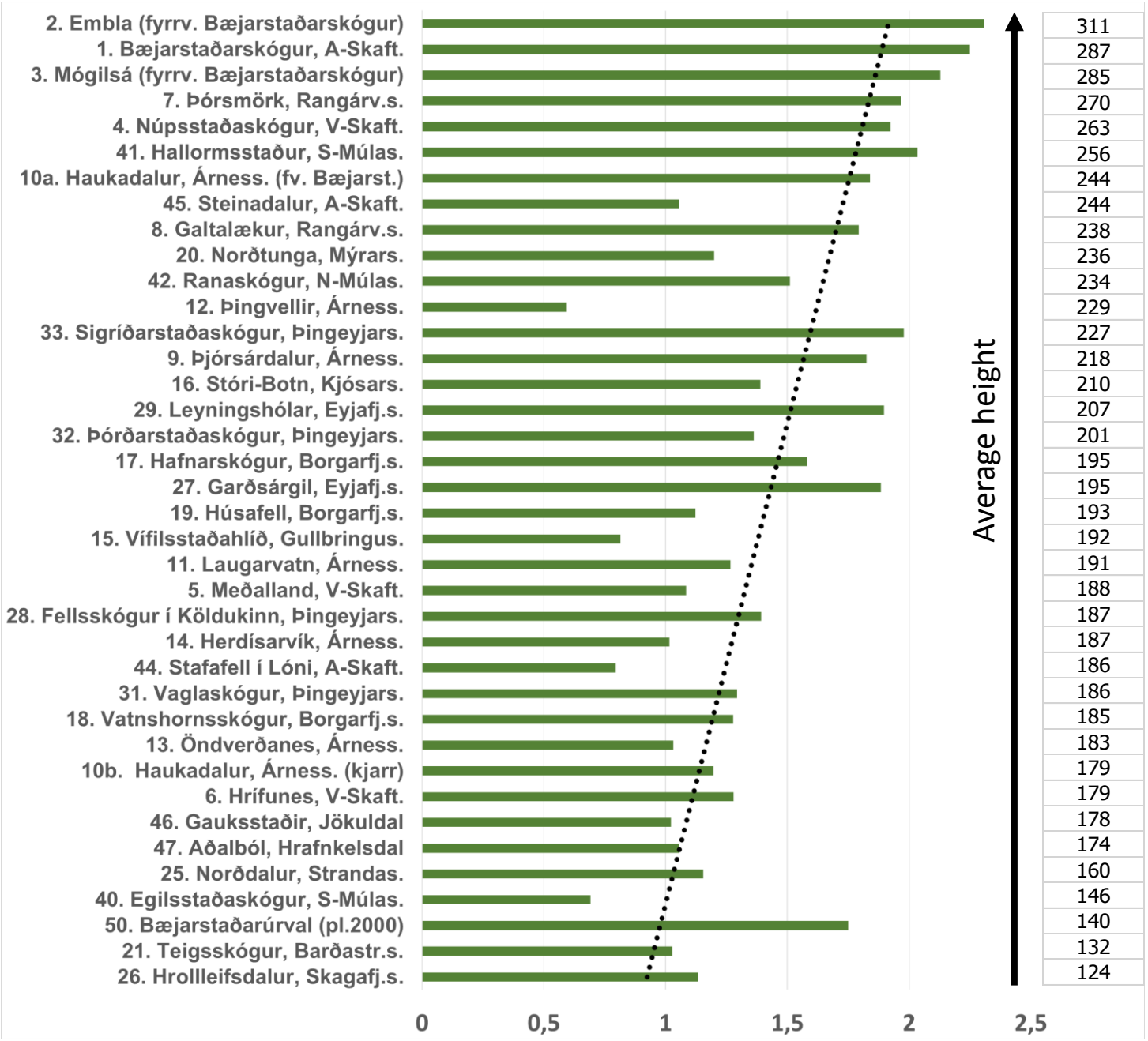
*Heringocrania unimaculella*



Other insect damage



# Provenances

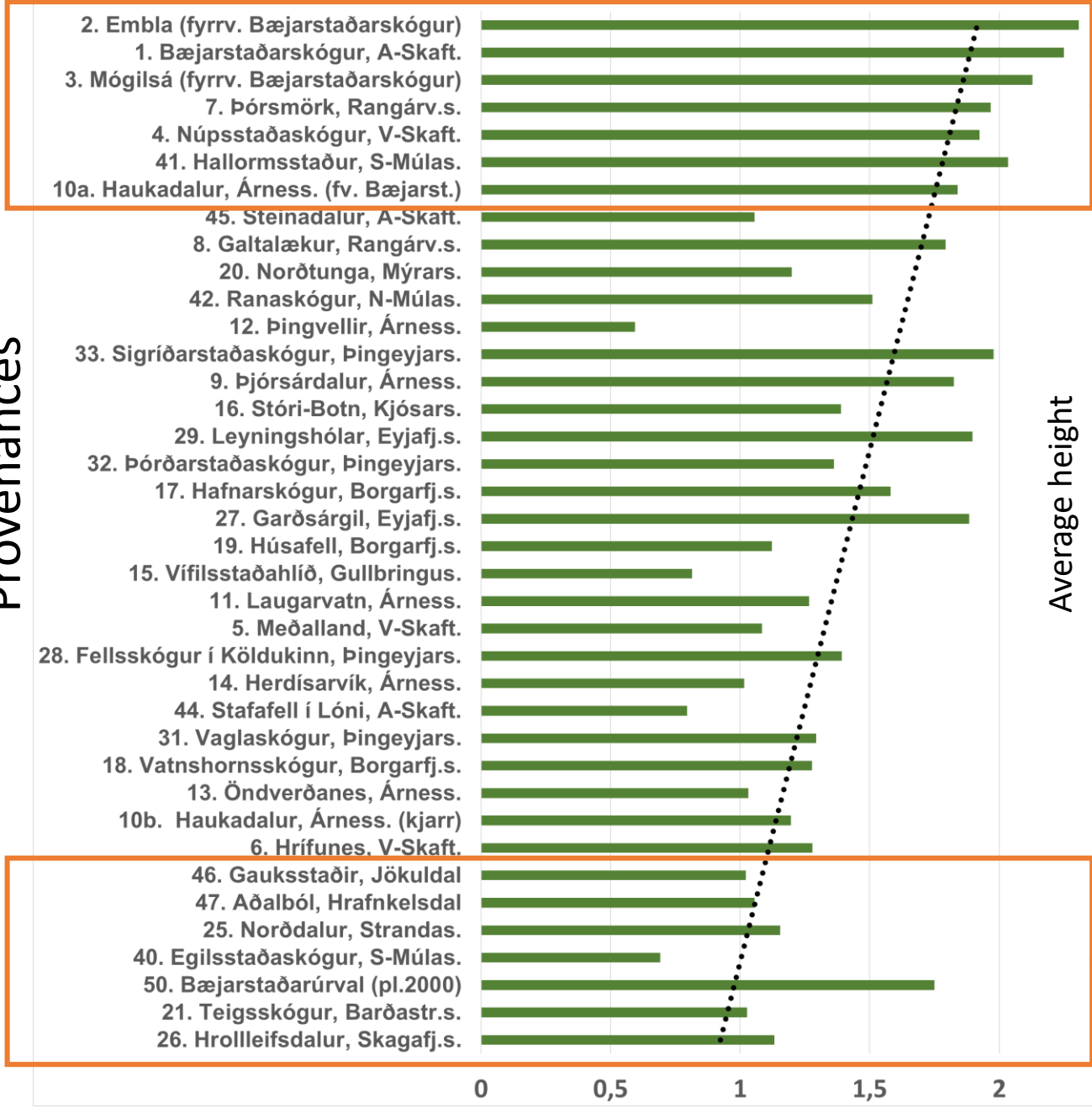


Average height

Damage

Provenances

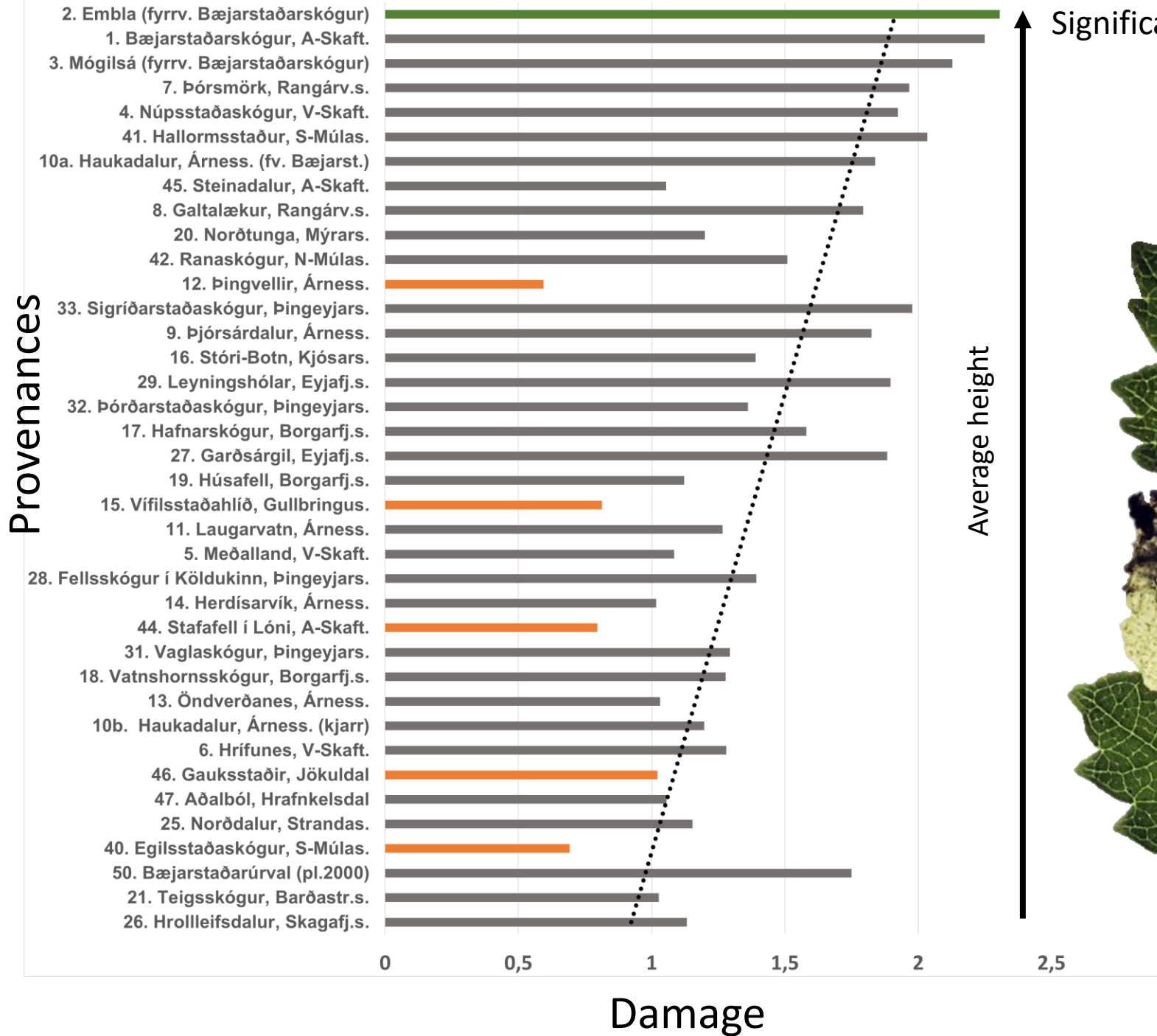
Average height



Provenances	Height
2. Embla (fyrrv. Bæjarstaðarskógur)	311
1. Bæjarstaðarskógur, A-Skaft.	287
3. Mógilsá (fyrrv. Bæjarstaðarskógur)	285
7. Þórsmörk, Rangárv.s.	270
4. Núpsstaðaskógur, V-Skaft.	263
41. Hallormsstaður, S-Múlas.	256
10a. Haukadalur, Árness. (fv. Bæjarst.)	244

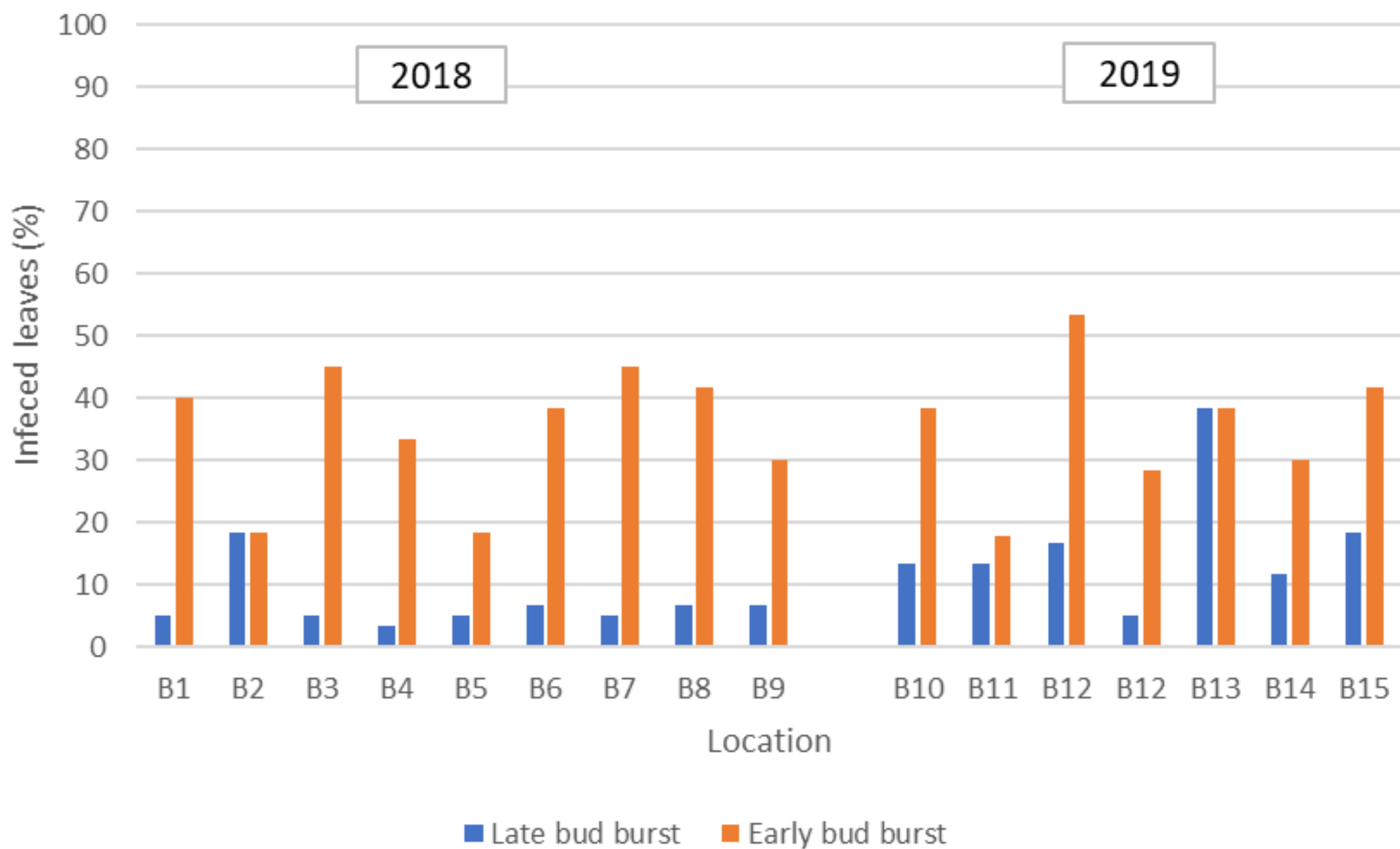
Provenances	Height
26. Hrollleifsdalur, Skagafj.s.	124
21. Teigsskógur, Barðastr.s.	132
50. Bæjarstaðarúrval (pl.2000)	140
40. Egilsstaðaskógur, S-Múlas.	146
25. Norðdalur, Strandas.	160
47. Aðalból, Hrafnkelsdal	174
46. Gauksstaðir, Jökuldal	178

Damage



# Can we explain this different between provenances?

- Optimal Oviposition Theory or “preference–performance hypothesis” implies that females undergo a strong selection pressure to choose oviposition sites in an optimal way
  - “The mother know best”
  - Fast growing trees with bigger leave area → More food for larvae
- Oviposition of *Heringocrania unimaculella* takes place early in spring, right after bud burst



# Summary

- Since *Heringocrania unimaculella* was first found in Iceland, its distribution range has been expanding and outbreaks occurred
- First findings show that *H. unimaculella* is attracted to provenances of birch that are fast growing
- There was no relationship found between birch height and damage of other Lepidoptera larvae
- Plants with early bud burst seems to be more damaged than those with late bud burst
- Could be useful information for birch provenances selection in Icelandic forestry in the future

# Thanks!

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