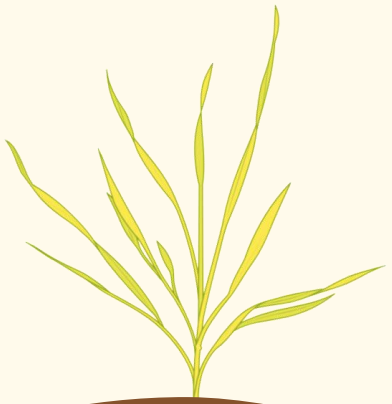
Helping barley grow on low nutrient soils using ancient genetics

Zoë Marshall

Supervisors: Joanne Russell, Chiara Campoli, Tim George, Davide Bulgarelli and Allan Logan





The challenge: Modern barley cannot grow well on low nutrient soils



The challenge: Modern barley cannot grow well on low nutrient soils



Modern barley

Manganese (Mn^{2+}) is needed for photosynthesis

~60% yield loss

~70% of UK soils are Mn-deficient



We need barley suited to low nutrient soils!

Bere

An ancient barley

>3000 years old









Bere

An ancient barley

>3000 years old







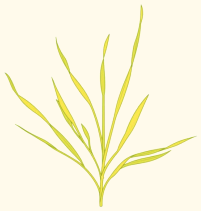
AIM: Identify the genes underlying high Mn uptake in Bere

Modern barley





Genetic mapping approach



Modern
KWS Irina

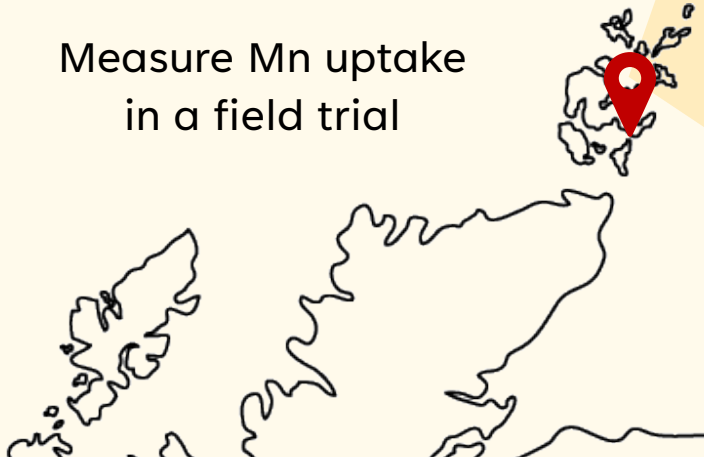
x

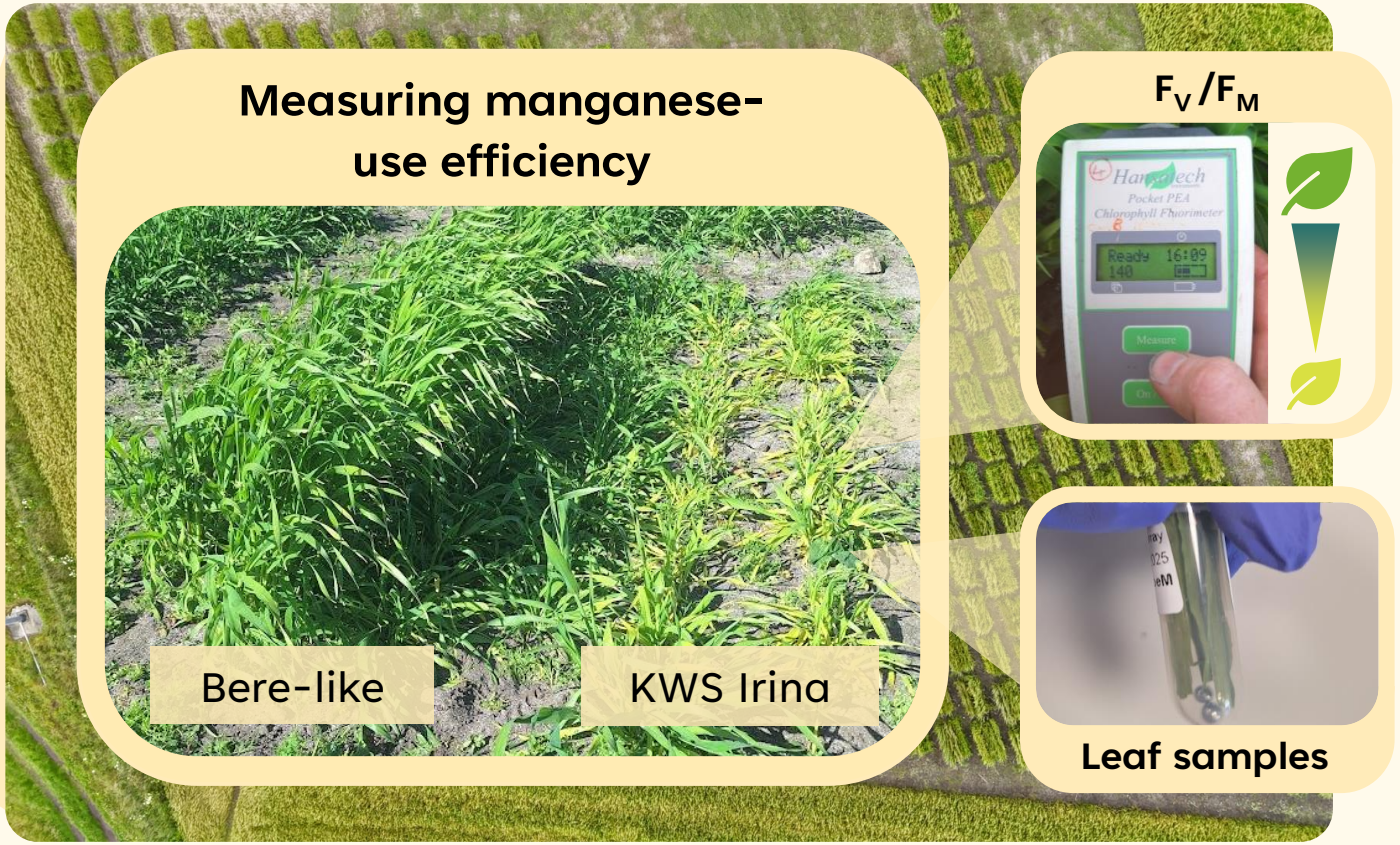


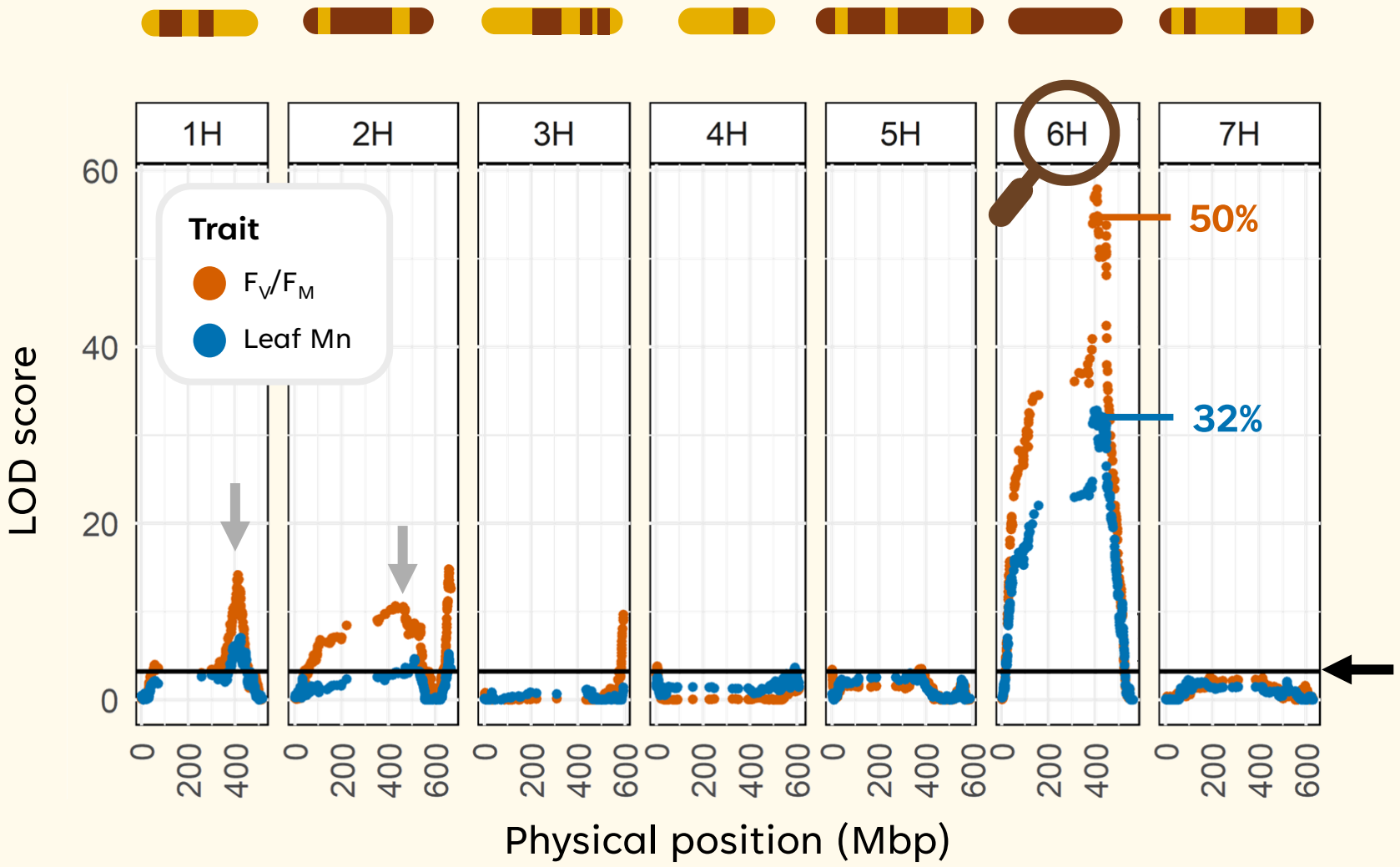
Bere
Bere Unst

~400 F_7 lines

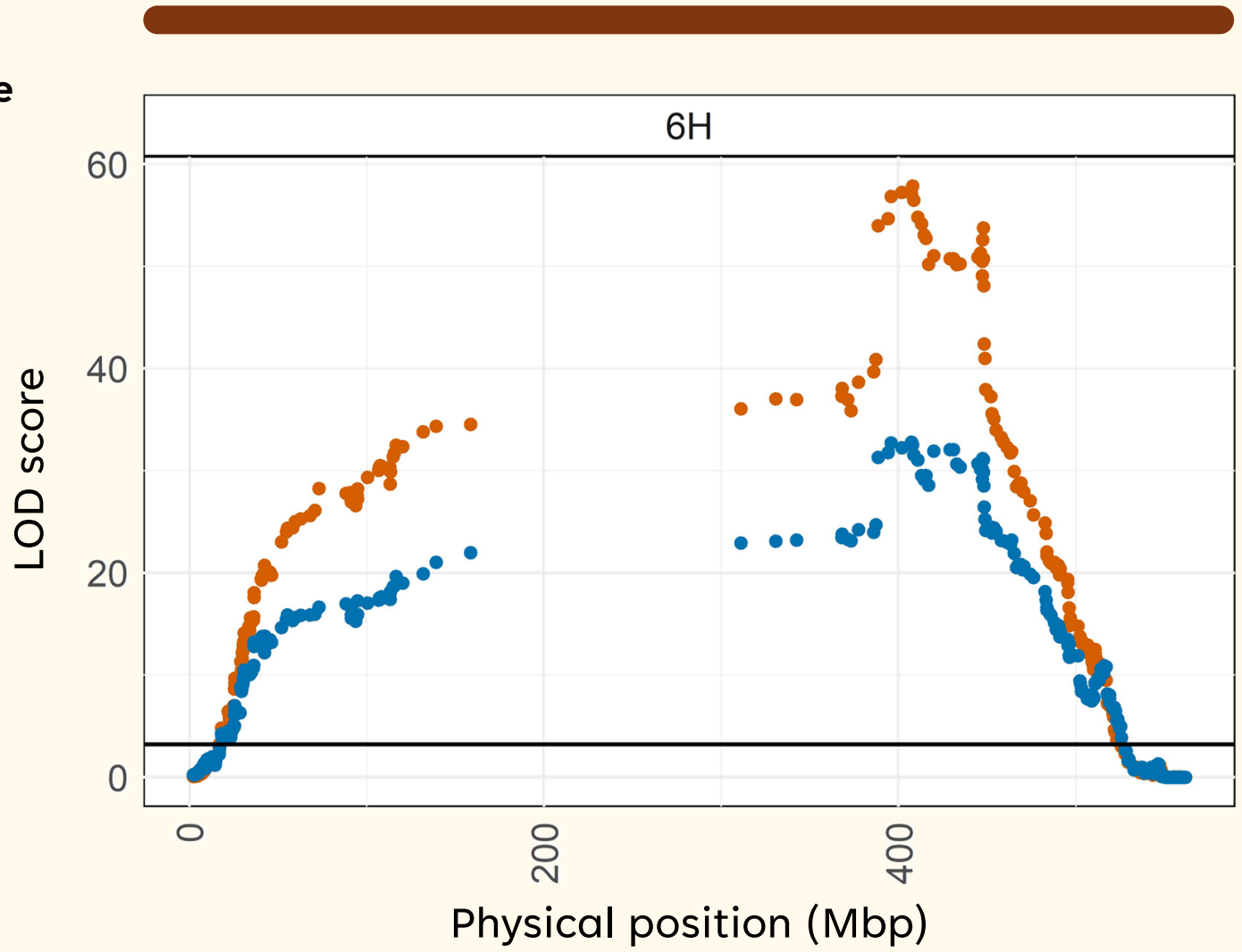
Measure Mn uptake
in a field trial



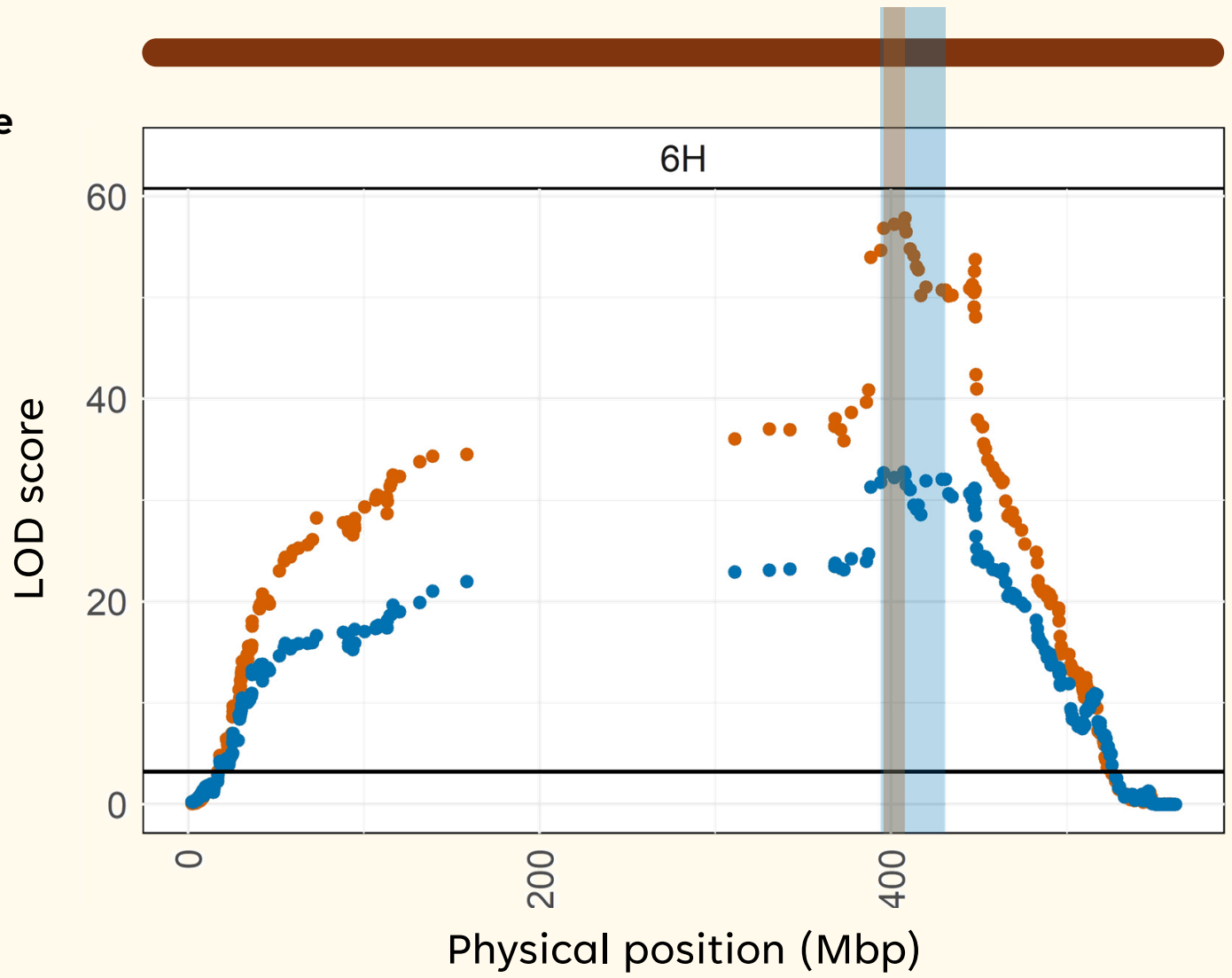



1H
2H
3H
4H
5H
6H
7H
60
40
20
0
LOD score
Trait
F_V/F_M
Leaf Mn
50%
32%
0
200
400
600
Physical position (Mbp)

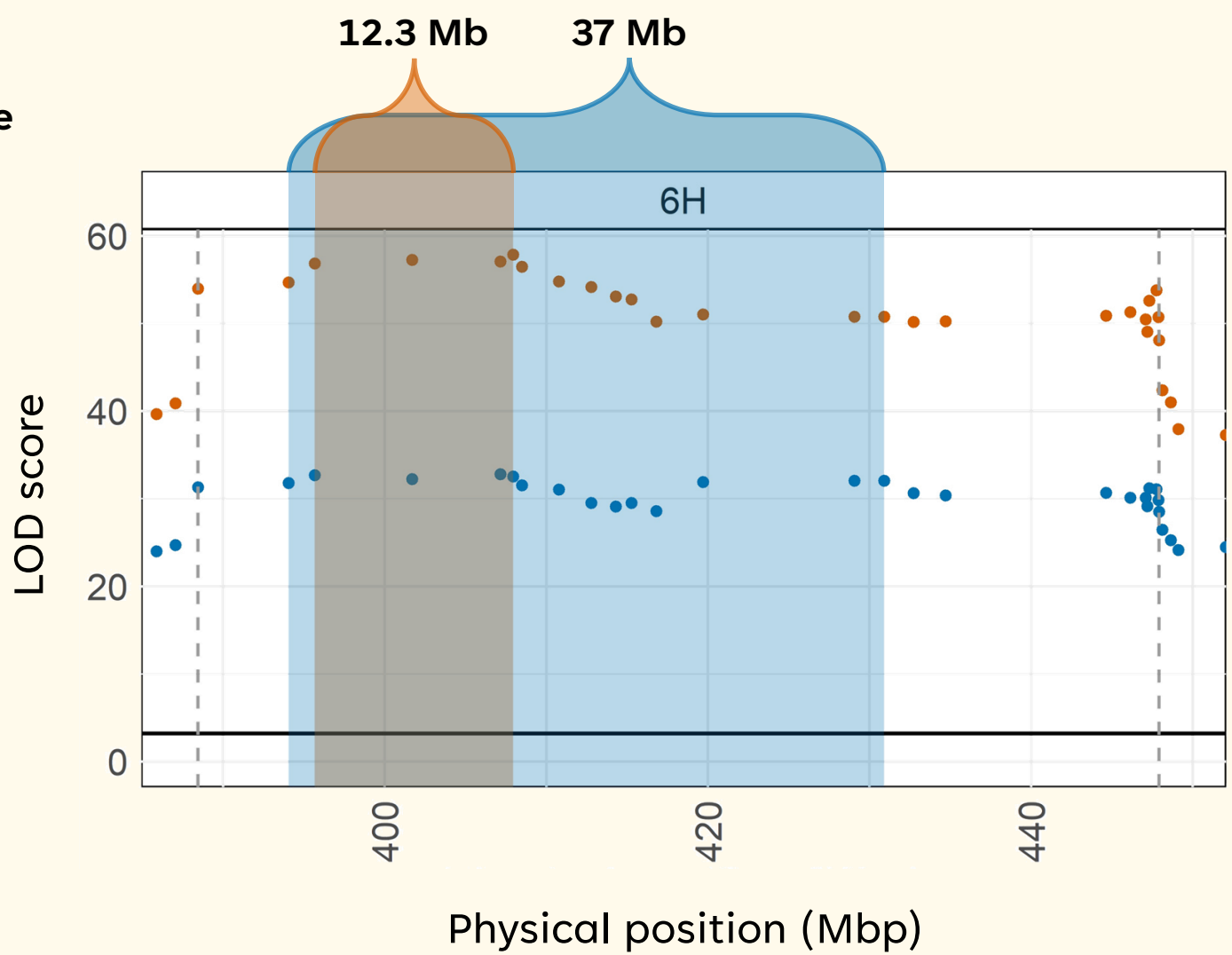
95% Bayesian confidence intervals



95% Bayesian confidence intervals

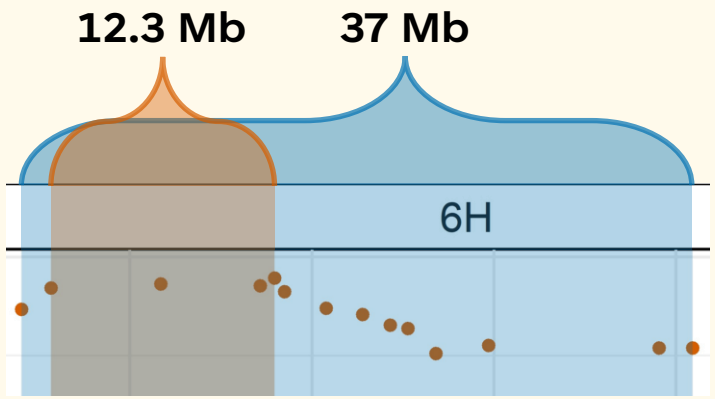


95% Bayesian confidence intervals



Ion channels

Transcription factors



165

533

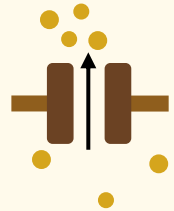
Gene count from the **Morex gene list**

Manually inspected gene description

Photosynthesis genes

Nutrient transporters

VIT
MRS2-C
YSL



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>3000 years old







Next steps: Identify the candidate gene(s)
Ongoing gene expression experiment

Impact: Help produce barley that can grow on poor soils with minimal inputs, supporting sustainability goals within agriculture