

What’s killing juniper? *Phytophthora austrocedri* infection increases with microsite soil moisture

FLORA DONALD, SARAH GREEN, KATE SEARLE, NIK J. CUNNIFFE, BETH V. PURSE

BACKGROUND

- Juniperus communis* s. l. is one of three UK native conifers and a keystone species for biodiversity. Populations are declining nationwide from inappropriate management and lack of regeneration
- P. austrocedri* is a soil borne, oomycete pathogen of trees in the family *Cupressaceae*, discovered in 2007 in Argentina as the causal agent of “mal del ciprés”
- P. austrocedri* is prevalent in the plant trade but only confirmed to infect wild juniper in Great Britain, where it is now endemic, causing rapid decline of populations

METHODS

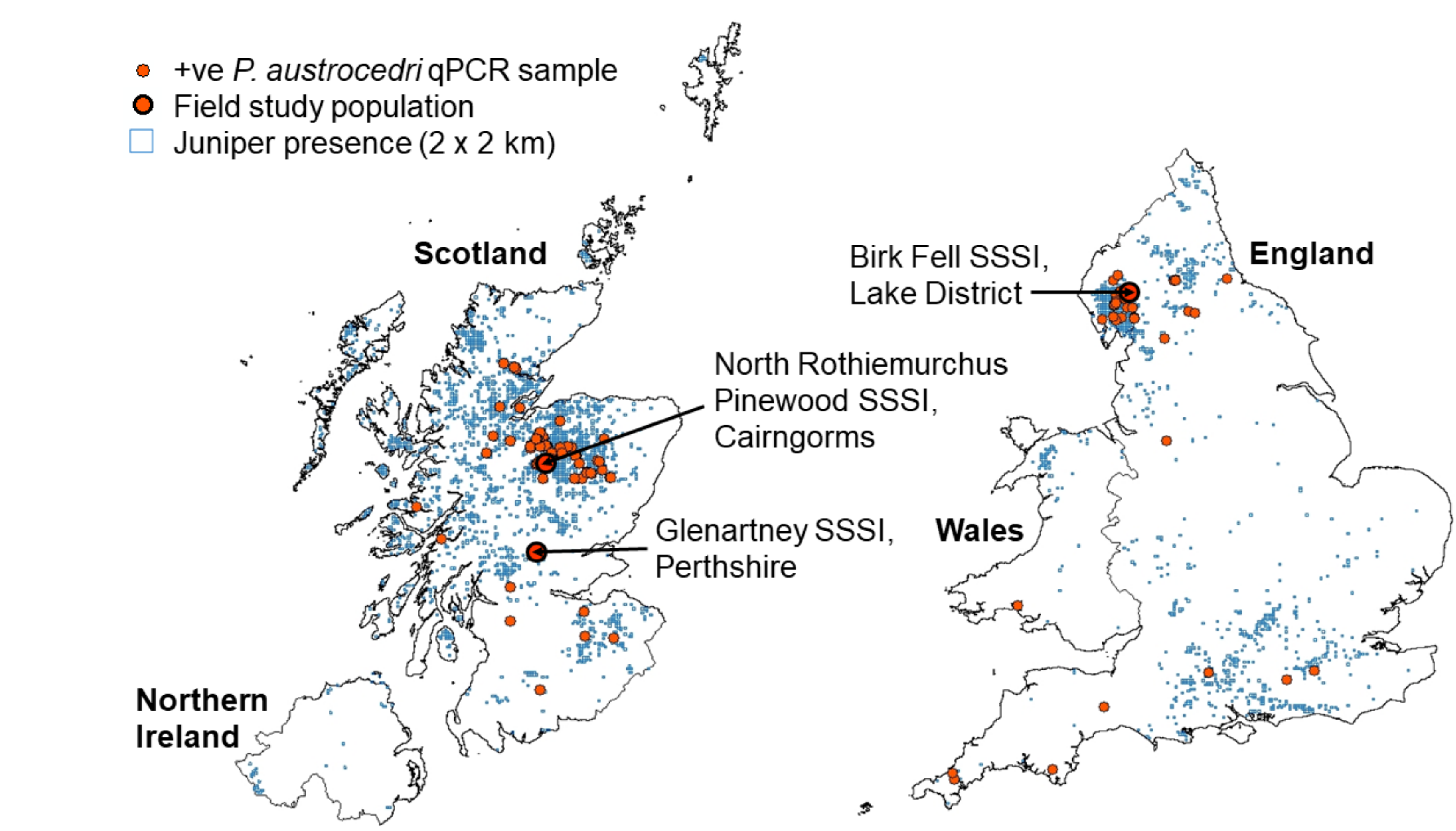
- Study area: 3 geographically separate juniper populations with different infection histories
- Sampling: 50 quadrats (10 x 10 m) per population, in peak transmission season, distributed across juniper density, altitude, slope & watercourse proximity gradients
- Dependent variable: area of symptomatic juniper/total area of juniper per quadrat
- Predictor variables: include soil moisture, herbivore damage and associate vegetation
- Relationships tested using Bayesian Generalised Linear Models (GLMs) and multi-model inference

RESULTS

- Good model accuracy (RMSE 21-23%) obtained for Lake District and Cairngorms populations with less severe infection
- Only consistent strong relationship found across all populations was increasing symptoms with increasing soil moisture, measured directly with a soil moisture probe or as watercourse proximity or increased cover of plant species indicative of high water tables

DISCUSSION

- Predictor variables are likely to differ with scale e.g. juniper connectivity may be more important at landscape scale. This will be examined in further PhD chapters.



Juniper distribution from BSBI 2000 – 2017
qPCR records from Forest Research, FERA & DAERA

1st investigation of drivers of spatial patterns of *P. austrocedri* infection of juniper

- Q1 Can symptom severity be predicted from abiotic / biotic variables at field scale?
- Q2 Do these predictor variables differ between populations?
- Q3 Can these results improve juniper management for conservation?



CONCLUSION

- High risk microsites are waterlogged or close to streams and can be identified using plant species indicators
- Soil disturbance (including footfall, drainage works, planting) in these areas should be restricted to reduce disease transmission out of high risk microsites

	Juniper population		
	Perthshire	Lake District	Cairngorms
Number of models	10751	1503	7167
RMSE	42.59	22.99	21.09
Area of <i>Dryopteris dilatata</i> (m ²)	***	-	-
Area of <i>Rubus fruticosus</i> agg. (m ²)		*	-
Area of <i>Erica tetralix</i> (m ²)	-	-	***
Soil moisture (quadrat average % VWC)	**		
Watercourse proximity (m)		***	
Altitude (m. a. s. l.)	**		
Herbivore damage (m ²)	*		-
Juniper neighbourhood connectivity			
Berry bearing (m ²)			
Slope (°)			
Habitat type (NVC)		-	
Soil type		-	
Grazing activity to nearest animal track (m)		-	-
Aspect (°)	-	-	

Table 1: Best GLM for each study population showing strength and direction of predictor variable relationships

Relationship strength	
Strongest	***
Very strong	**
Strong	*
Weak	
Absent	
Excluded	-
Relationship direction	
Positive	
Negative	

@aFhloraIdh
flodon@ceh.ac.uk



Please report symptoms to Tree Alert
<https://www.forestry.gov.uk/treealert>

