

Detection of *European mountain ash ringspot-associated virus* in rowan trees in Great Britain



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INTRODUCTION

In the uplands of Scotland, rowan trees (*Sorbus aucuparia*, European mountain ash) are associated with the native Caledonian pinewoods and are most abundant on the mountain and coastal fringes of the Northwest. Because of its robustness, mountain ash is an important founder that fundamentally contributes to the biodiversity of woods (Raspe et al. 2000). Virus-like symptoms in rowan such as **leaf mottling** and **chlorotic ringspots** have been reported to occur frequently in mountain ash trees in Great Britain (Robel et al. 2013). Such symptoms could be associated with *European mountain ash ringspot-associated virus* (EMARaV) a multipartite (-)ssRNA virus representing the type-species of the newly established genus *Emaravirus* (Mühlbach & Mielke-Ehret, 2011), but the virus was never confirmed in rowans in Great Britain so far.

GENOME ORGANISATION OF EMARAV

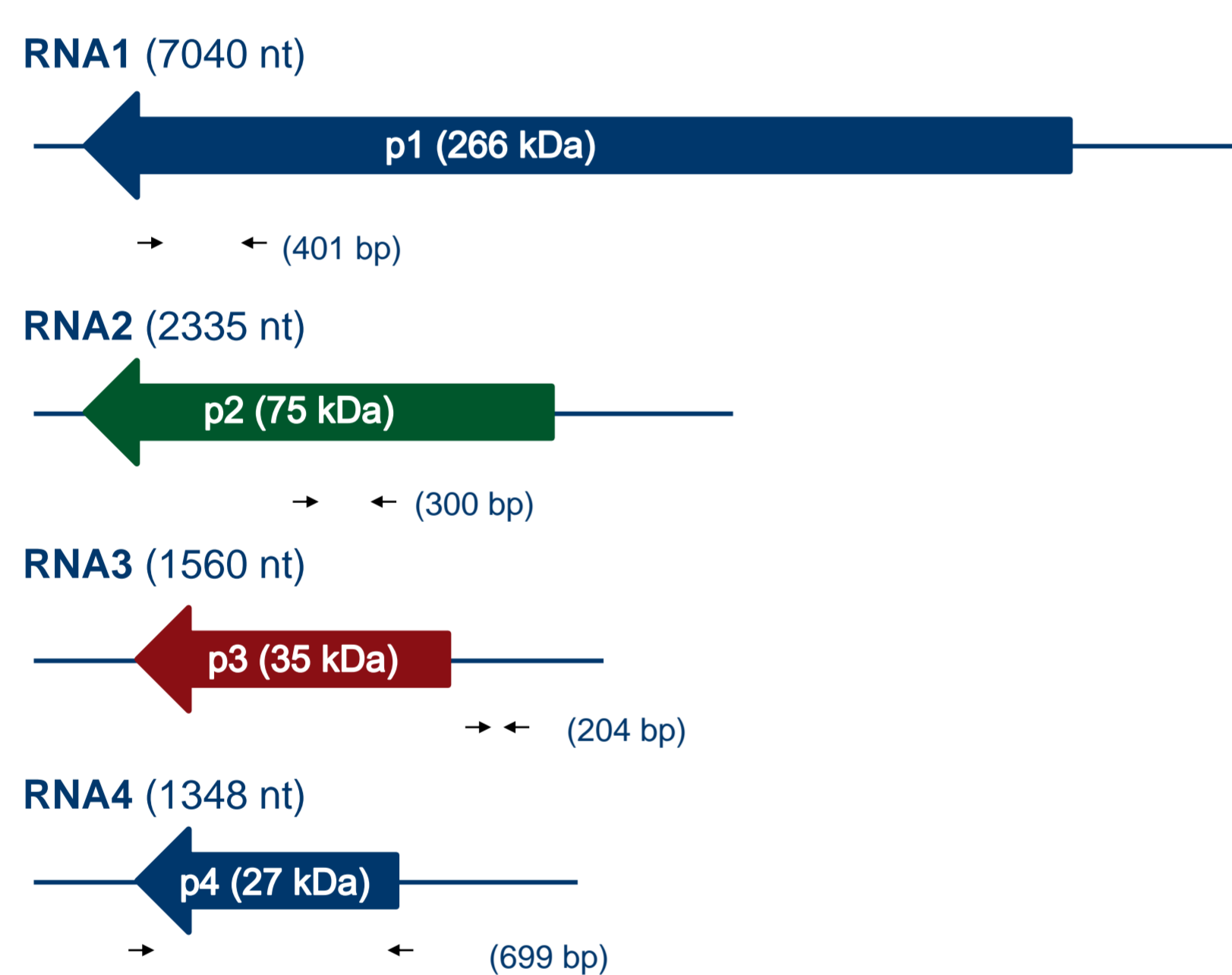


Fig. 1: Genome organisation of EMARaV. Virus RNAs are given with encoded ORFs with locations of primers (black arrows) used for RT-PCR of specific fragments from all four genome segments.

EMARAV-DETECTION BY RT-PCR

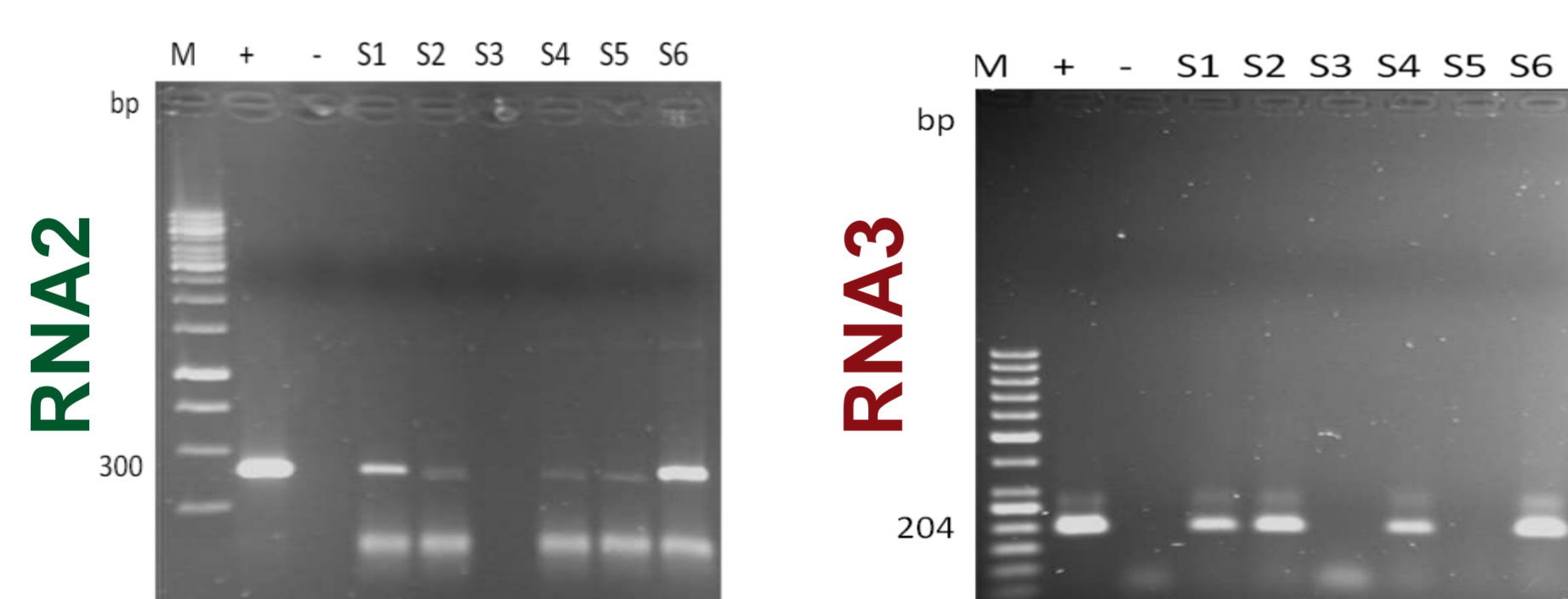


Fig. 2: RT-PCR detection of EMARaV by RNA2 and RNA3 specific products in 6 rowan trees (S1-S6)

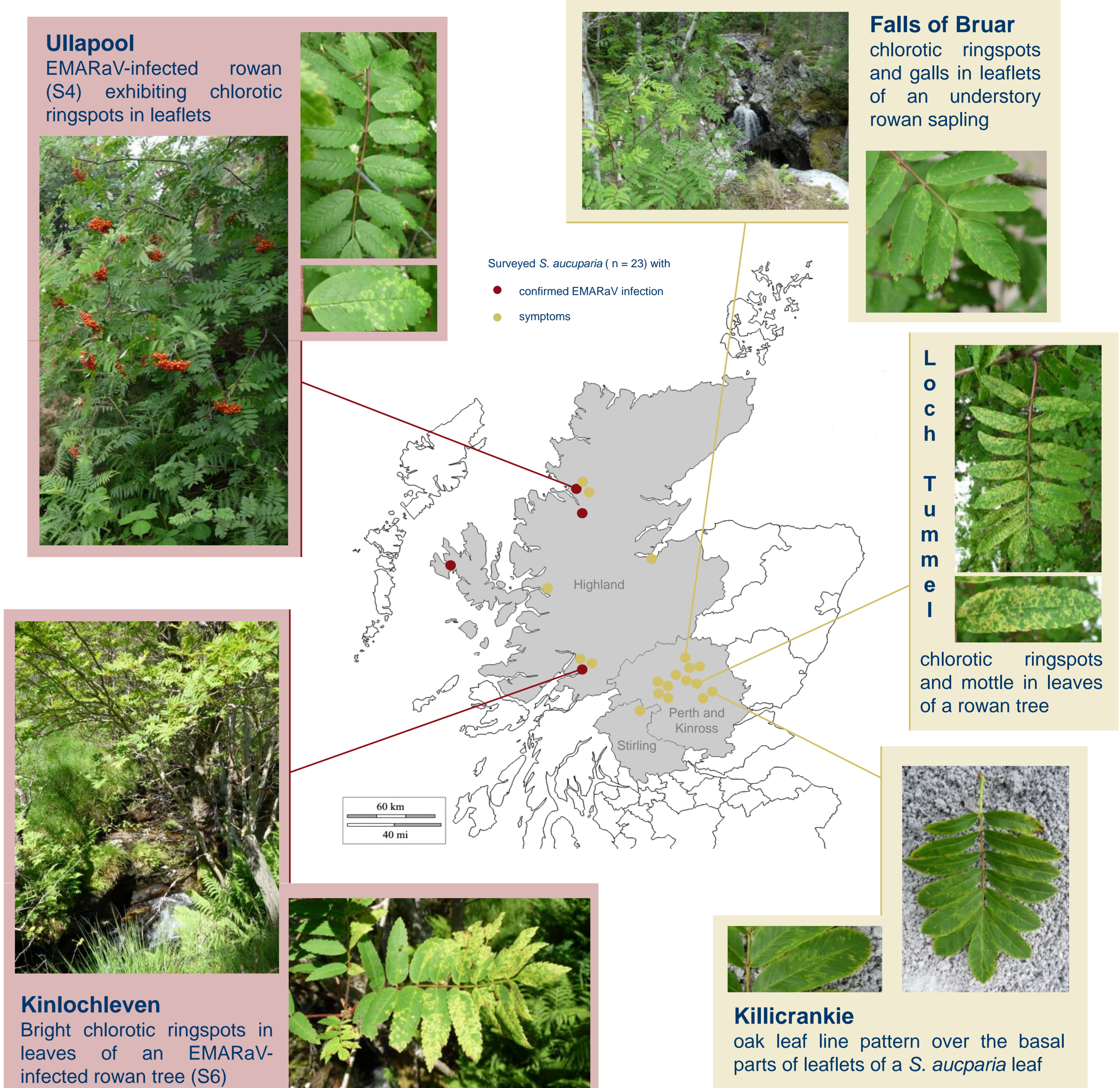
Table 1: EMARaV detection in 6 rowan trees (indicated by colored circles) investigated by RT-PCR targeting all 4 genomic segments of the virus (- = no specific product)

ID	Origin	symptoms	RT-PCR			
			RNA1	RNA2	RNA3	RNA4
S1	Skye	chlorotic ringspots	-	●	●	●
S2	Ullapool	chlorotic ringspots	-	●	●	●
S3	Ullapool	chlorotic ringspots	-	-	-	-
S4	Ullapool	chlorotic ringspots	-	●	●	●
S5	Corrieshalloch Gorge	chlorotic ringspots	-	●	●	●
S6	Kinlochleven	chlorotic ringspots	●	●	●	●

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OCCURRENCE OF SYMPTOMS IN ROWAN TREES IN SCOTLAND IN JULY 2011



PHYLOGENETIC ANALYSES OF RNA2 AND RNA3 FRAGMENTS OF EMARAV

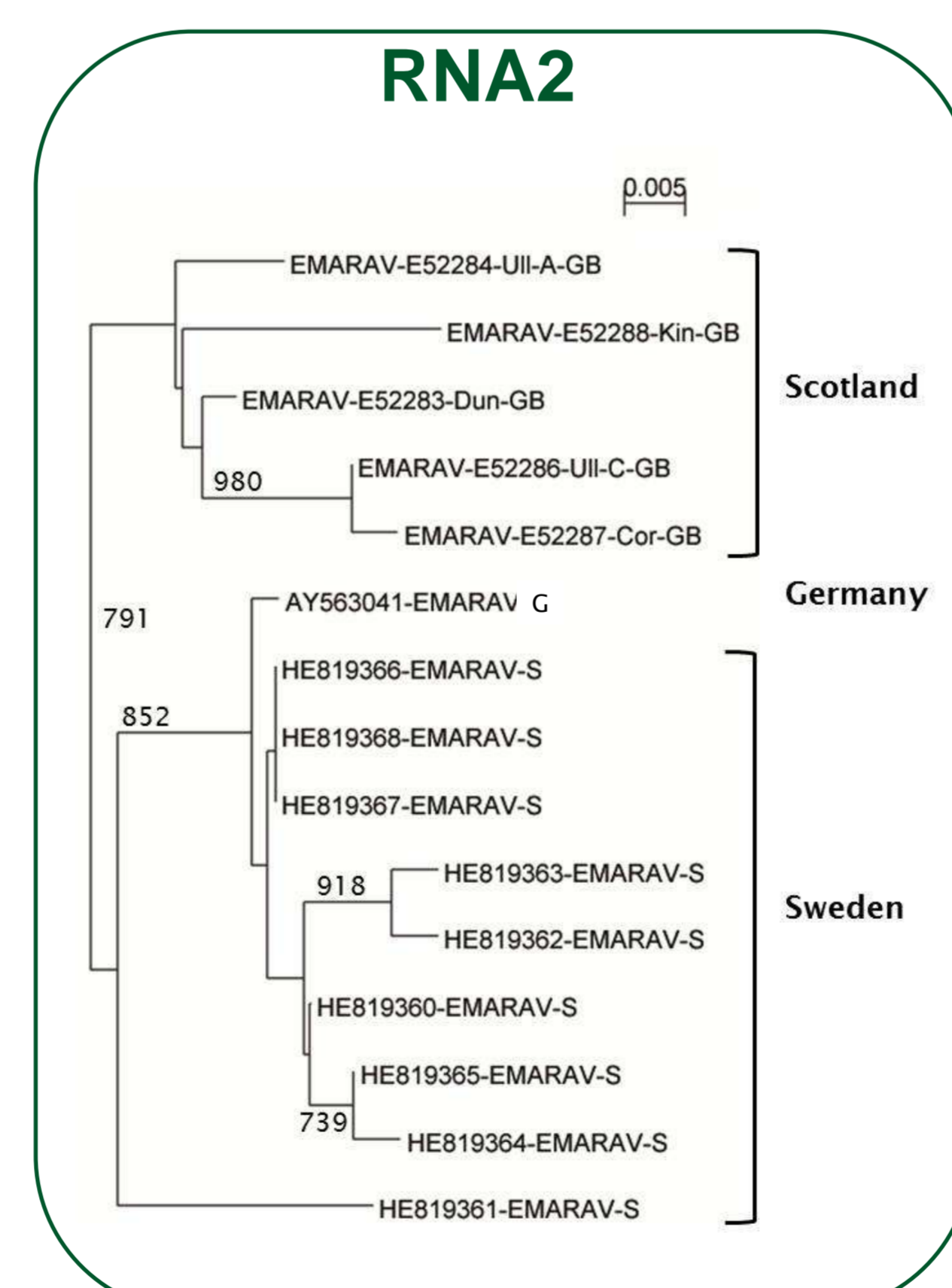
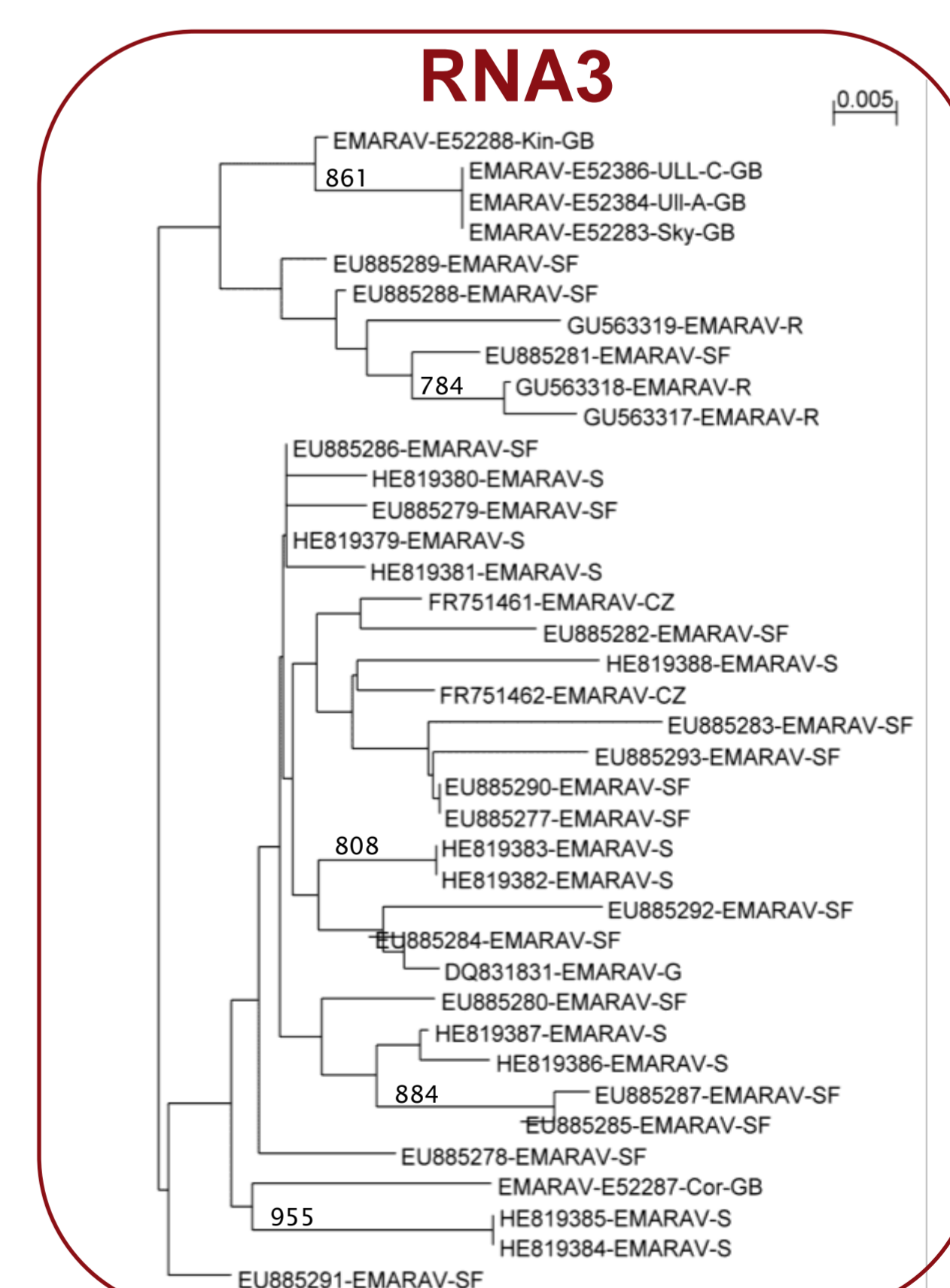


Fig. 3: Phylogenetic tree inferred from the nucleotide sequence alignment of the partial glycoprotein precursor-encoding region of RNA2 (261 bp, left) and of the partial 3' untranslated region of RNA3 (160 bp, right) of EMARaV applying the neighbour-joining algorithm. Bootstrap analysis was performed with 1000 repetitions and values above 700 are indicated at branches. The scale bar of 0.005 represents 5 nucleotide substitutions per 1000 nucleotides of the aligned sequences.



RESULTS AND CONCLUSIONS

- observation of 23 rowan trees with chlorotic ringspots, mottling and oak leaf line pattern in 3 council areas of Scotland (Highland, Perth and Kinross, Stirling)
- Detection of EMARaV in 5 out of 6 sampled mountain ash trees (Fig. 2, Table 1)
- Confirmation of EMARaV in *S. aucuparia* for the first time in Great Britain
- In a neighbour-joining phylogenetic tree generated from the partial RNA2, sequence variants obtained from Scottish trees formed a distinct cluster (Fig. 3)

REFERENCES: Mühlbach HP, Mielke-Ehret N. 2011. In: King A, Lefkowitz E, Adams MJ, Carstens EB. *Virus Taxonomy: IXth Report of the International Committee on Taxonomy of Viruses*: 767–770. Raspé O, Findlay C, Jacquemart AL. 2000. *Journal of Ecology* 88: 910–930. Robel J, Bandte M, Mühlbach HP, von Bargaen S, Büttner C. 2013. In: Dujesiefken D. *Jahrbuch der Baumpflege*: 47–53.