



2024 Dumfries & Galloway Crab Apple Testing

Background...

Scotland's native wild apple is the 'scroggie'. Scroggie is a local Scot's word for crab apple, wooded pasture and small wild woods.

Work has been underway in recent years to better understand the Crab Apple population in Dumfries & Galloway. The region has been identified as a nationally significant location for 'pure' Crab Apple Trees.

Previous work on this topic is summarized here: <http://www.swcwt.org/crab-apple-project.html>.

In 2024, Dumfries & Galloway Woodlands and Jools Cox worked in partnership with Markus Ruhsam from the Royal Botanic Garden Edinburgh and citizen scientists from across the region to collect and then DNA-test a further 110 local apple trees, measuring their 'pure' ness.

This project was made possible thanks to funding from The National Lottery Heritage Fund.



Crab Apple (*Malus sylvestris*)...

Crab Apple (*Malus sylvestris*) is the only apple considered 'native' to the UK.

For a thousand years or so, Crab Apple has shared the British Isles with the more recent arrival, the cultivated apple *Malus domestica*. The propensity to hybridise over time has resulted in many trees in the UK containing genes from both *Malus sylvestris* and *Malus domestica*. In some areas, few 'pure' *Malus sylvestris* trees remain.

Dumfries & Galloway seems to have a higher than normal level of 'pure' crab apple trees. A number of reasons are cited for this, such as historic land use and population density.

Certified 'pure' crab apple trees are therefore an important part of the national tree landscape and can be used to restore populations.

Previous testing...

Work in 2022 by the South West Scotland Community Woodlands Trust gathered 113 samples out of which 92 were classed as 'pure' *Malus sylvestris*: an 81% rate of 'pure' trees.

The trees sampled were entirely in the Stewartry or Wigtownshire areas of the D&G region – i.e. the west.

Full info here: <http://www.swcwt.org/crab-apple-project.html>.

2024 Sample collection...

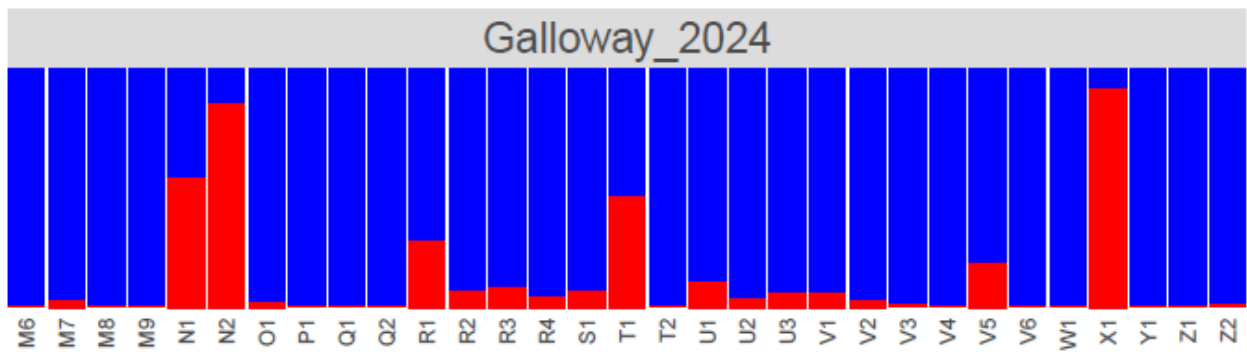
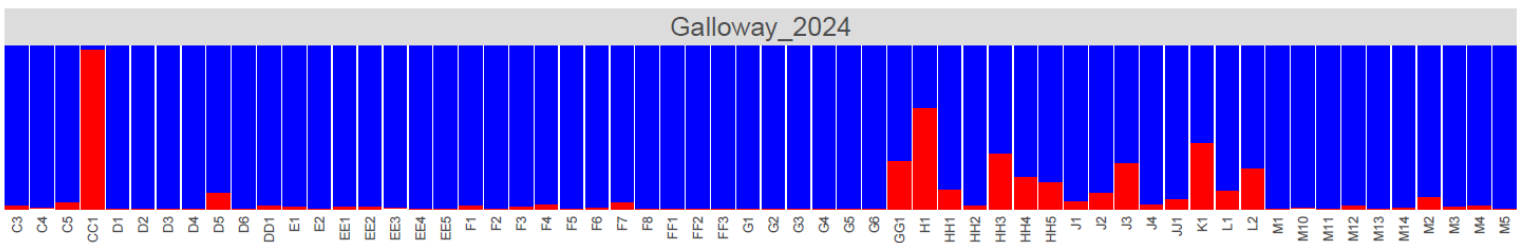
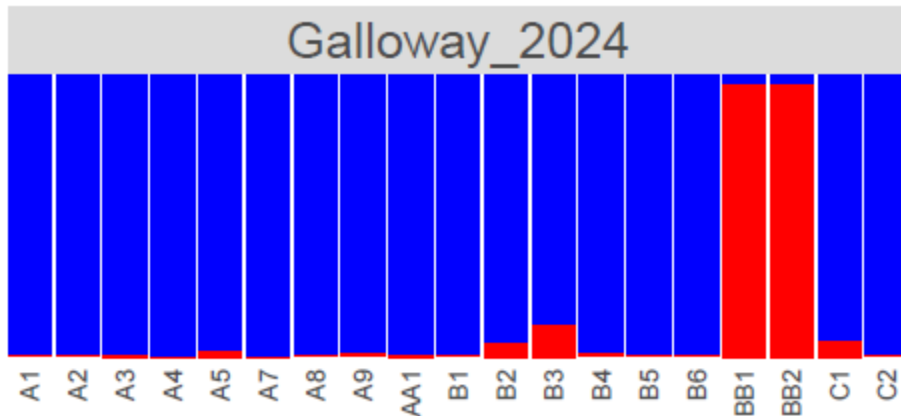
The previous batch had found an 81% 'pure' result. This inspired discussion with others about purity of trees not researched at this time. To build understanding further, and with a view to exploring whether there was any east/west spread of 'pure' trees, the opportunity for a further batch of testing was secured.

The week of 19-25th August (2024) was identified as 'Crab Apple sampling week'. The opportunity was advertised through Dumfries & Galloway Woodlands Channels, with citizen scientists invited to collect two leaves from potentially 'pure' trees. These were compiled by Jools Cox & McNabb Laurie from Dumfries & Galloway Woodlands and submitted to Markus Ruhsam at RGE for DNA Testing.

Results...

A total of 111 samples were posted to Markus for testing in August 2024. One sample was found to be unsuitable for testing (probably due to degraded DNA).

Results can be shown as a bar chart as follows, Markus advises: *“In the bar plot you can see the genetic proportions in each tree which is likely to come from the native crab apple (blue) and the domesticated apple (red).”*



Markus advised when reviewing the results:

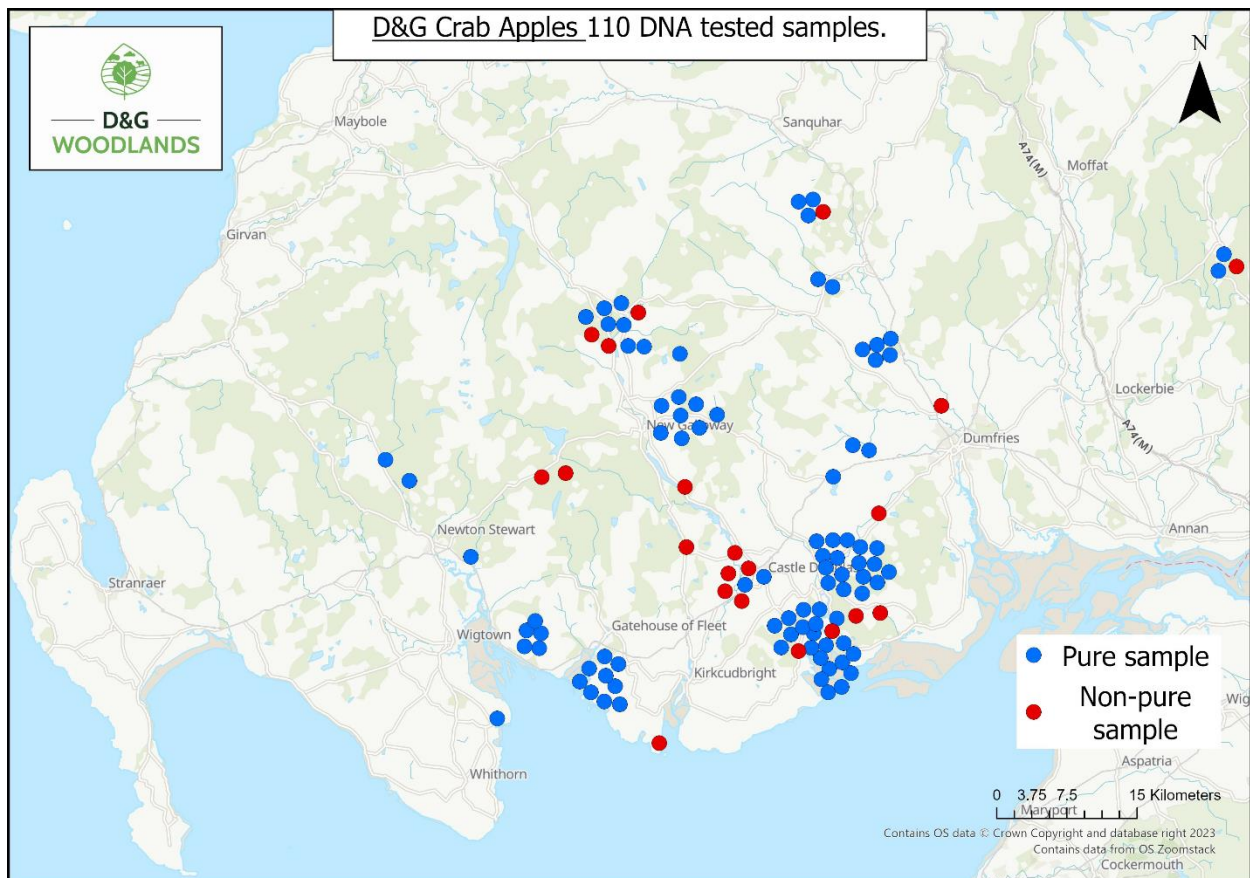
“The genetic analysis showed that 21 of the 110 screened samples (18%) had a M. domestica contribution (red in the bar plot) of 10% or more. 10% is an arbitrary cut-off point which I generally use to define a sample as ‘pure’ M. sylvestris, i. e. if the maximum contribution from the M. domestica genome is 10% or less it is classed as ‘pure’. The analysis included 829 samples (110 D&G samples and 719 samples from the UK). Including more or different samples can easily change the percentages by a few percentage points and push a pure sample ‘over the edge’ or a possible hybrid sample ‘into pureness’, however, this generally doesn’t affect the overall picture.

5 of the 21 hybrid samples are M. domestica (BB1, BB2, CC1, N2 and X1) – BB1 and BB2 had exactly the same genotype (i.e. are clones and very likely are the same cultivated variety), 4 have genomic contributions close to an F1 (H1, K1, N1 and T1), 8 close to a backcross to M. sylvestris (GG1, HH3-5, J3, L2, R1, V5) and 4 are at the border between a pure and a backcross M. sylvestris (B3, HH1, L2 and U1). These ‘border’ samples have domestica contributions of just over 10%, so if the pureness level was set at 15% M. domestica contribution, then these would be pure and are likely candidates for ‘shape shifters’ in another analysis with other or additional samples.

This is not unexpected and means we have to adjust our perception of ‘pureness’ to the realities of a 1000 years of possible hybridisation between M. sylvestris and M. domestica in Britain. Basically this is as pure as it gets these days and I personally feel that a tree with more than 80% M. sylvestris is still a pretty good M. sylvestris tree.”

Map of Results...

Using Grid references provided it was possible to map the results, using **RED** to highlight the 21 samples that had a *M. domestica* contribution (red in the bar plot below) of 10% or more.



(Note: Where multiple trees submitted very close to each other, dots have been clustered for indicative purposes)

Conclusions...

It is possible to draw a number of conclusions from this work:

- The 2024 samples were almost exactly the same proportion 'pure' as the 2022 batch – at approximately 80%.
- There is no obvious east → west distribution of 'pure' trees, nor coastal vs inland.

Next Steps...

This topic and these findings will be explored further at an online event planned for Tues 28th January 2025 at 7.30pm entitled '**Galloway Crab Apples - A year of discovery**'

Full info + book free ticket: <https://fienta.com/galloway-crab-apples-a-year-of-discovery>.

Thanks...

Thanks to all involved, the citizen scientists and crab apple activists across the region, Jools Cox, Markus Ruhsam and the Dumfries & Galloway Woodlands Team.

This batch of testing was made possible thanks to funding support from The National Lottery Heritage Fund and partners including Scottish Forestry, Woodland Trust Scotland, Dumfries & Galloway Council's Environment Team.

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November 2024