



# The search for Scotland's native forest apple: *Malus sylvestris*

Rick Worrell *and colleagues report on a project to survey and describe Scotland's misunderstood and maligned crab apple.*

For the past year we have been on the hunt in Scotland for wild-grown *Malus sylvestris* which, following the Latin name, we might think of as the 'forest apple'. Of course, most people use the name 'crab apple' and think of small, scruffy trees in hedgerows. But there is a whole lot more to *Malus sylvestris* than that.

Let's put to one side the question of why (on earth!) foresters might be interested in wild-grown apples, and start with the practicalities. Several things make this task more difficult than it should be. Very few people have paid any attention to apples in the wild so we do not know where to look for them. And when we find them, we are seldom sure which species we are looking at.

Out there in our woods there are crab apple trees (*M. sylvestris*), which may be wild, or may have been planted. Then there are wild-grown domestic apples (*M. domestica*), courtesy of several centuries of casually-flung apples cores. To add to the confusion, Forestry Commission and some local authorities have planted Chinese crab apples (*M. hupehensis*) and Siberian crab apples (*M. baccata*) as part of their mix of landscaping trees around conifer plantations, picnic sites and buildings; and in places such as Argyll, these have overcome staggering geographical shifts and started to regenerate freely. And joy of joys, all these species are capable of interbreeding and hybridising.

Fortunately, none of those involved in this project understood this at the start, or we might have thought twice. We set off simply to answer some basic questions:

- Occasionally we bump into impressive wild-grown apples in forests so why is it that we know nothing about their ecology or genetics?
- *Malus sylvestris* is apparently a native species, so what is its distribution in Scotland and what are its basic ecological characteristics?
- Elsewhere in Europe there is concern that hybridisation between crab apples and domestic apples may lead to the disappearance of *M. sylvestris*, in exactly the same way that wild cats are affected by hybridisation with domestic cats. Is that a problem here, and can we cast light on that by looking at their DNA?

Attempting to answer these questions by looking at literature is a non-starter because there are absolutely no scientific papers nor articles on the ecology or genetics of crab apples

Above: Crab apple and bluebells. Photo: Rick Worrell.



Our problems in locating trees got solved in short order when we got our hands on two databases. Firstly, we found that there were 25 trees listed on the Ancient Tree Hunt Inventory. Secondly, we extracted locations from the National Biodiversity Network and we got hold of the Botanical Society of Britain & Ireland (BSBI) distribution map (Fig. 1). However, this map comes with an important caveat:

“This map covers both the native *M. sylvestris* (crab apple) and the alien *M. domestica* (domestic apple) and...the two species hybridise and seem to be connected by a range of intermediates, which are included on the map...and all records are mapped as if they are native.”

So whilst that is an interesting map, we do not know if it really tells us anything concrete about the distribution of *M. sylvestris*.

similar features to the BSBI map:

- Strongholds: Dumfries and Galloway, Ayrshire, Eastern Borders, Loch Lomond/Trossachs, Perthshire.
- Blanks: Pinewood zone and the northern Highlands; seemingly anywhere with seriously acid geology.
- Intriguingly little in the western Highlands.

While the NWSS was hugely helpful, we have since discovered that the crab apples recorded actually include all the various species and hybrids mentioned above, and the quality of data varies hugely by region, according to the skill level of individual surveyors. Frustratingly, nearly all of the records in the western Highlands turned out to be false positives (they were not apples at all).

At the time of writing (July 2017) we have visited about 160 trees on our way to a target of 200, and have taken DNA samples to allow Royal Botanic Garden Edinburgh (RBGE) to identify them to species and their hybrids. In addition, we recorded the key morphological characteristics and tried to identify them to species this way (true crab apples have small leaves that are almost entirely hairless on their lower surfaces when viewed through a hand lens). We then recorded the dimensions of the trees and the basic ecology of the sites where they occur.

### Discoveries to date

The first thing to say is that most trees are magnificent, characterful and deserve to be celebrated and

published in the UK. And the few sections in British forestry books on apples make quite a hash of the topic. So it seemed to us that there was something worth pursuing: a Scottish native tree which we collectively know virtually nothing about.

### Looking for apple trees

We started the search for wild-grown apple trees by getting the word out to likely suspects: foresters and ecologists who know their woods and keep their eyes open. Confounding expectation, this yielded very few trees. However, it did reveal some intriguing insights. Some people thought that *Malus sylvestris* was not native; others regarded all wild-grown apple trees as feral domestic apples, and some thought that all crab apple trees had been planted. This seemed to run counter to our field experience, but we have kept some of those misgivings in mind.

Our experience is that crab apples are exceptionally attractive, and a crab apple wood in spring is as magical as any native wood anywhere. So we ask you simply to take notice of them, and think of them as Scotland's forest apple.



Fig. 1. Distribution of *Malus sylvestris* in Britain according to the BSBI.

Lastly, we discovered that the wonderful Native Woodland Survey of Scotland (NWSS) recorded apples, and Forestry Commission Scotland kindly sent us a file with 900 polygons containing crab apple trees in Scotland. We used this to produce a map (Fig. 2), effectively giving a second distribution map of crab apples in Scotland, with several

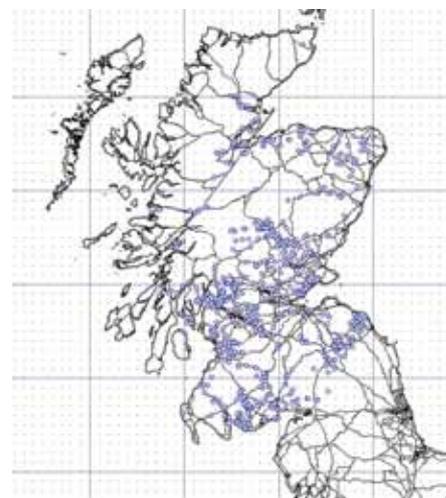


Fig. 2. Location of woods where crab apple is recorded in the Native Woodland Survey of Scotland (data from Forestry Commission Scotland).

treasured, rather than ignored as has largely been the case to date. In terms of numbers, they hit the sweet spot where they are common enough to be ecologically significant, but rare enough to be notable when you find them, rather like aspen.

The biggest trees are larger than reported in the literature; we have found trees up to 15 metres tall and some get close to a meter in trunk diameter. They are mostly old, we are guessing 100 to 150 years, and a high proportion are veterans trees. In upland areas (such as the southern Highlands, and Dumfries and Galloway) the vast majority appear to be self-set, rather than planted, though planting has no doubt happened. In the lowlands, as with other tree species, most appear to have been planted.

Crab apple trees occur at elevations from sea level (we even have a sample from a sea cliff in Shetland obtained by swimming), to about 300 meters above sea level; and evidence from the Lake District suggests they are capable of growing higher than this. We found them in native woodland, both ancient and secondary, in wood pasture, in fields, hedges, and along railway tracks. A significant proportion were found in upland gully woodlands. There is an interesting population at high tide mark on the islands in Loch Lomond. They appear mainly in oak-birch woodland (NVC W10/11) and ash woodland (NVC W9), and occur mainly on brown earth soils but sometimes stray onto gleys.

We found very few crab apple seedlings and saplings, suggesting

Below: Crab apple in a wood pasture; Large coppice crab apple tree in Grandtully. Photos: Rick Worrell, James Renny.

that the current era presents fewer opportunities for regeneration than times past. That said, we have observed that crab apple trees flower and fruit profusely and the fruits mostly have a good number of viable seeds that germinate easily.

So far we have found very few beside old habitation such as farms, clachans, and sheilings. So where you might expect to find other co-habittees with humans, such as rowan, gean and sycamore, you do not find crab apple. However, they are common in both wood pastures, often as pollarded trees, and in hedges, suggesting past management. There is absolutely nothing about the distribution and ecology that suggests *M. sylvestris* is anything other than a bona fide native tree.

The vast majority of the trees are in rude health. They appear to be incredibly resilient. They blow over and resprout freely as 'phoenix trees'. They frequently grow hollow then collapse, but then get a second wind and start growing again. Broken limbs will live on and recover provided they are connected to the main stem by the thinnest strip of bark. So far we have only found one tree apparently affected by disease.

Based on their morphology, we estimate that in the uplands probably 60 to 70 per cent of wild-grown apples appear to be true *M. sylvestris* rather than hybrids or other species. In contrast, in the lowlands, domestic apples and hybrids appear to be in the majority. But until we look at their DNA (which is work in progress) we do not know for certain.

**What next?**

We would like to get a new generation of true *M. sylvestris* out

into the landscape. So the main endgame of this project is to find a good selection of such trees, and bring these together as grafts, and form seed orchards. This is probably the only reliable way to get seed into the nursery trade. There may also be areas in Scotland where genetic conservation in the wild is a smart idea, such as Loch Lomond and parts of Kirkcudbrightshire and Galloway. And we would like to know more about how to regenerate them in the wild and about historical ties between people and crab apples.

Crab apple trees suffer from an image problem. The common name, and its colloquial equivalent 'scroggie', derives from words meaning small, untidy and scrubby. Its genus name *Malus*, means 'evil-one': think of mal-words like malformed, malice, malaria (=evil air), dismal (=dies-mal or bad days) and many more; because the apple was the evil fruit that tempted Eve and led to mankind's expulsion from the Garden of Eden (with an attendant whiff of misogyny). This is quite some cultural baggage to burden a small tree with. Our experience is, after 160 trees and counting, that there is nothing 'mal' about them; crab apples are exceptionally attractive, and a crab apple wood in spring is as magical as any native wood anywhere. On the continent, crab apple trees are regarded as 'noble hardwoods' capable of timber production. So we ask you simply to take notice of them, and think of them as Scotland's forest apple.

**Acknowledgements**

This paper is dedicated to the memory of Patsy Wood, who loved all things to do with trees and woods. We wish to thank the Patsy Wood Trustees, the Scottish Forestry Trust, Sustainable Forestry SCIO and Forest Enterprise Tay District for supporting this research.

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