Searching for birches

Over the last couple of years I have been lucky enough to travel into some beautiful and remote areas of the world to study birch trees in their native environment.

The landscapes of northeast India and Georgia may be very different, but they both support several species of Betula – species that are largely unknown to the majority of gardeners.

Birches of northeast Arunachal Pradesh

In October 2010, I took part in a plant study expedition under the leadership of Keith Rushforth to the northeast corner of Arunachal Pradesh in India, close to the border with Burma. This part of the state has long been a disputed territory between China and India so westerners have frequently been barred from entering, with only the
occaisional group getting access to the forests of this land. For this reason the flora of the region is largely undisturbed and unstudied.

My interest was in the Betula and *Alnus* of the area. I wanted to study them in the wild and see which species existed through the various layers of forest, and observe their relationships with other plants. I was grateful to receive an RHS bursary to help with the costs of this expedition.

We observed four species of birch in the Mishmi Hills of Anjaw district – namely Betula alnoides, *B. ashburneri* *B. cylindrostachya* and *B. utilis*. We also found birches that appeared to be a hybrid of *B. ashburneri* and *B. utilis*, *Betula alnoides* and *B. cylindrostachya* occur at the lowest altitude, present as occasional trees or in groups of no more than four or five, from 900 to 2,500m. Seedlings grow on open ground at roadsides and landslip sites, generally on sloping ground facing south or west. In the cloud forest both species grow to 20m with a trunk diameter of 40–75cm. Both have smooth, glossy, whitish-grey to creamy-brown bark, but the long, thick, closely spaced lenticels give the bark a rough appearance. The outer bark peels in thin tatters at the base, but is quite tight and non-peeling through most of the tree. At the base of mature trees the bark is heavily cracked and plated, with fewer lenticels. In crowded conditions branching starts at about two-thirds height, giving a light and open crown. Younger trees to 10m in open arable areas form broader spreading crowns with major branch junctions happening lower down.

It seemed that *B. cylindrostachya* was less common, but it is difficult to separate from *B. alnoides* using trunk morphology alone. The saplings at low altitude on roadsides were probably *B. cylindrostachya*, judging by the number of leaf teeth between vein-end teeth and the twigs being very hairy. Higher up, the big trees were mostly *B. alnoides* because they were autumn-flowering, whereas *B. cylindrostachya* is spring-flowering – the best way of differentiating these two species. Both produce a distinctive smell of wintergreen when the bark or shoots is wounded. *Betula utilis* occupies the 2,200–3,000m zone and there is some overlap with *B. alnoides* in the cloud forest. Higher up, in the temperate forest, *B. utilis* is the only birch. Here it stands among *Abies*, *Alnus*, *Pinus*, *Quercus* and *Tsuga*. It is an attractive tree, the only one in this area with such a smooth, colourful trunk, reaching a height of 15–20m as it competes for light. We found seedlings on disturbed ground and on the rotten trunks of fallen trees.

The bark of mature *B. utilis* in this area is dark reddish-brown to purple, and smooth and free-peeling in large sheets. At the base, the outer bark is thicker and cracks away in chunks while still retaining the colour and texture of the higher bark. Like *B. alnoides* lower down, *B. utilis* in the forest branches at two-thirds height, producing a thin, open crown. Younger trees at the upper limit of temperate forest (2,900m) have many lower branches and a much broader shape, though are still quite delicate. Higher up, where the forest peters out, *B. utilis* rarely gets to more than 10m and the bark is paler, showing more silver among the dark reds and browns. This increase in betulin, which gives the white
colour, is probably due to higher light levels. At this altitude (3,000m), *B. utilis* can be found in groves and closer groupings.

The highest altitude birch in the Mishmi Hills is *B. ashburneri*, found at 3,000–3,700m. This was an exciting discovery for us, as it was only previously known to exist in Tibet, Yunnan and Sichuan. This suggests that it will be recognized across more of the Himalaya in the future. In the past it has probably been recorded erroneously as a stunted form of *B. utilis*.

*Betula ashburneri* here is generally a gnarled, twisted, multi-stemmed shrub to 3m. Its shape is evidence of exposure and the amount of snow its branches have to bear in the monsoon season. At the lowest end of its range it can be quite upright, with fewer stems and a height to 5m.

The bark on high-altitude *B. ashburneri* is grey-brown with a metallic sheen. It is rougher than *B. utilis* with short lenticels and peels in thin tatters. The most obvious difference is in the mature fruiting catkins. These are held on very short peduncles, either horizontal or upright, whereas on *B. utilis* they hang pendent on longer peduncles.

On the slopes above temperate forest *B. ashburneri* is common, often forming dense thickets or copses alongside *Abies, Acer, Rhododendron, Salix, Sorbus* and *Vaccinium*. Generally it occupies boulder slopes or riverside sites. Even at these altitudes the litter layer is deep and there is plenty of moisture. Material from these trees has been analysed by Richard Buggs and Nian Wang of Queen Mary, University of London, who confirmed it as diploid (2n=28), whereas *B. utilis* is tetraploid (4n=56).

The most interesting discovery in this area was populations of small trees in two valleys at about 2,900m. In both cases this was the cross-over zone between temperate-forest *B. utilis* and alpine *B. ashburneri*. What we noticed first was the unusual bark – grey-brown, but matt and rough with only round lenticels. There was a complete absence of elongated lenticels and the bark hardly peeled at all. The trees were 6–8m high, but quite broad and spreading, sometimes with several stems, but not truly multi-stemmed. The leaves resembled those of *B. utilis*, but were more hairy on the underside. The twigs were slightly rough and very hairy, again much more hairy than those of *B. utilis*. There were 10–14 leaf veins and the leaf margins were turned down, making the teeth more visible from the side than the top – again, different to *B. utilis*. The ripe fruits were pendent and the fruit scales were similar to those of *B. utilis*, but the male catkins were smoother than those of *B. utilis*. We only found a few trees, and only in a small corridor between *B. utilis* and *B. ashburneri*. It is unlikely that they are a separate species. Therefore, we could only conclude that we had come across a zone of natural hybrids.
Uses in cultivation
The dark reddish brown bark of *B. utilis* from Arunachal Pradesh would make an excellent feature in a garden. There are already trees of a similar colour in cultivation from Sinclair & Long’s collections in Bhutan, such as *B. utilis* ‘Bhutan Sienna’. But the Arunachal Pradesh trees are a darker colour so an introduction from here would be worthwhile.

Both *B. alnoides* and *B. cylindrostachya* are from warmer, subtropical forest. They are less suitable for northern Europe and, although some have grown well in sheltered areas, most current introductions are not reliably hardy. The trees we saw were at quite low elevations, so it is unlikely their new growth would ripen enough in our poor summers to survive the winter.

*Betula ashburneri*, on the other hand, would make an interesting addition to even the smallest garden. With its quirky, multi-stemmed habit it could be an intriguing foil for other plants, and the autumn leaf colour is an attractive yellow. In Arunachal Pradesh it did not grow beyond 5m in height and was usually much smaller. It would be interesting to see how its size would be affected by our milder climate. I expect it to be fully hardy.

**Birches of the Caucasus mountains of Georgia**

In September 2012 I set off on an expedition to the ex-Soviet country of Georgia in the Caucasus mountains. Georgia lies at a botanical and cultural crossroads between Russia in the north and Persia in the south, with Europe and the Black Sea to the west and the Caspian Sea and Asia to the east. It is a mountainous, heavily forested land with a great diversity of plant life, thanks mainly to its avoidance of the great ice ages of the past. Its geographical position has resulted in the preservation of several species of *Betula* unique to the Caucasian region – the reason for my visit. The expedition was supported financially by the RHS Blaxall Valentine Fund, the Stanley Smith (UK) Horticultural Trust, Plant Heritage Devon Group, the Percy Sladen Memorial Fund, and the Royal Forestry Society Randle Travel Fund.

Most published research on these trees has been carried out by Russian and Georgian botanists. It is not widely available in English so our knowledge is limited to plants growing in UK botanic gardens and a few translations by Russian botanist Dr AK Skvortsov.

Manana Khutsishvili, head of the herbarium at Tbilisi Botanic Garden, kindly agreed to act as my guide and translator. She also organized a driver and vehicle, and arranged accommodation and local guides. This made the idea of roaming over the whole country in search of a few birches a more practical one.

In the herbarium at Tbilisi I found that *B. litwinowii* is very variable, hinting at widespread hybridization. Also, from herbarium specimens it is almost indistinguishable from *B. raddeana*, another Georgian species. *Betula medwedewii* also showed a great deal of variation.

We first travelled to the region of Samegrelo-Zemo Svaneti in the northwest. We were searching for *B. megrelica*, a very rare shrubby birch that is only known from one plant, and seedlings raised from it, that grew at Moscow Botanic Garden. It was collected on Mount Migaria and may just be a variant of *B. medwedewii*.

For several days we searched the hills around Mount Migaria. This involved 4-hour ascents of rough mountain tracks in a six-wheel Russian truck, followed by more enjoyable hiking through the tree...
line and across mountain ridges.

We did not find *B. megrelica* but did locate a small population of *B. medwedewii* on the slopes of Mount Jvari at 1,500–1,700m. These shrubs were multi-stemmed and 0.5–1.2m high. Found on open hillside with sporadic *Fagus orientalis*, *Picea orientalis*, *Sorbus graeca* and *Rhododendron luteum*, the shrubs showed much evidence of grazing damage by goats. This birch is very slow-growing, so grazing of apical growth removes the plant’s ability to flower and produce seed. This has obvious implications for the survival of this species in Samegrelo, where it must be considered endangered.

The other birch I found in Samegrelo was *B. litwinowii*, but identification was difficult. It is thought by some to be a variety of *B. pubescens*. Although some trees are this, others were intermediate between *B. pubescens* and *B. pendula*, which were difficult to distinguish from it.

Our next area of study was in the High Caucasus mountains around the town of Stepantsminda, in north Georgia on the border with Russia. The mountains reach 5,000m and are snow-clad throughout the year, with glaciers hanging off the upper slopes. Here we found woodlands of crooked, multi-stemmed *B. litwinowii* clinging to the mountainsides. At the top of their range, at about 2,150m, the trees are no more than head height, but lower down, at 1,900m, they are much larger. The multi-stemmed habit at high elevations seems to be caused by the climate. These woodlands were fascinating to wander through; full of twisted, gnarled, white stems, covered with moss and lichen.

In this area I also found one population of *B. raddeana* growing on a wooded scree slope at 1,655m. This species is known from other countries in the Caucasus region as well, but very little is known about it. All *B. raddeana* here were multi-stemmed with a height of 5–10m. Their bark was dark and rough on young stems, turning orange, pink and white on older stems.

After returning to Tbilisi we travelled southwest to the Adjara region on the Black Sea coast. Based in Batumi, we travelled inland to Mount Tbeti on the border with Turkey. In the company of local guide, David Kharazishvili of Batumi Botanic Garden, we found *B. medwedewii* at about 2,100m on open hillside with the same companion species we saw in Samegrelo. Here the shrub was growing with more vigour and appeared undamaged by grazing. They were all multi-stemmed with a height of 2–2.5m. Our local guides confirmed that they had not seen trees bigger than this, so it would appear to be their mature height in that location. They were attractive shrubs, full of upright fruiting catkins and their leaves just starting to show their yellow autumn colour. However, they were limited to one small area of mountainside in our study area. Our guides in Adjara stressed that *B. medwedewii* is rare, even in that district.

From Adjara we travelled inland to Bakuriani, a popular winter ski area. The mountains here are barer than on the coast, indicating a cooler climate. We found small groups of *B. litwinowii* above the tree-line, at 2,100–2,300m, and one area of crook-stem forest. But we did not find any *B. raddeana* here.

I managed to collect seed from *B. litwinowii* in many different areas. Once I have germinated the seed I shall be passing cambium tissue to Richard Buggs to carry out DNA and flow cytometry analysis. This will determine ploidy levels and give an indication of species relationships and levels of hybridization in the...
The same tests will be carried out with material from *B. medwedewii* and *B. raddeana*. We shall then have a much better understanding of the *Betula* of Georgia. Seedlings of Georgian birch will also be distributed to other gardens in the UK.

**Uses in cultivation**

*Betula medwedewii* and *B. raddeana* are occasionally available in the nursery trade. Trees of *B. medwedewii* in the National Plant Collection (NPC) at Stone Lane Gardens are twice the height of those in the wild populations I studied, so it would appear that the UK climate is kinder to them. *Betula medwedewii* makes an unusual shrub, with its quirky, multi-stemmed appearance, metallic yellow-brown bark, neat leaves and upright fruiting catkins. Grafted plants, usually onto *B. pubescens*, will become large shrubs. Plants raised from cuttings or seed will retain the characteristic small size.

*Betula raddeana* seems to be a variable species and almost certainly hybridizes with *B. litwinowii* in the wild. There is a limited amount in cultivation so it is worth introducing other provenances with different qualities. The trees I saw near Stepantsminda had good white stems when mature. It will be interesting to observe these trees as they grow in our NPC. Will they grow as multi-stemmed trees or will they react to our moderate climate by growing taller and straighter? And here we see one of the strengths of NPCs: a source of material of plants from the wild that might be suitable for commercial production in the UK.

*Betula litwinowii* needs more study before we can assess its commercial qualities. The various provenances need to be grown on and analysed to see if there is hybridization. Some of the trees I studied were graceful and delicate; qualities that are attractive in any garden.

**Conclusion**

Studying birches in so many wild locations, each with its own combination of climate and geology, has taught me a great deal about the role of these trees in mountain landscapes. I have been able to see which plants they cohabit with and the extremes of weather and terrain that they cope with.

In particular, it has been extremely useful to observe the environmental conditions in which *B. medwedewii* can thrive, and how precarious the existence of this rare birch is.

Paul Bartlett is Garden Manager at Stone Lane Gardens, Devon, where National Plant Collections of *Betula* and *Alnus* are held.