

The birch of north-eastern Arunachal Pradesh

Four species of birch have been observed in the Mishmi Hills of Anjaw district, north-eastern Arunachal Pradesh, India. *Betula alnoides*, *Betula cylindrostachya*, *Betula utilis* and *Betula ashburneri*. In addition, shrubby trees were discovered that appear to be some form of hybrid; probably of *utilis* and *ashburneri*.

Betula cylindrostachya and *Betula alnoides* appear at the lowest altitude, being present as an occasional tree from 900m to 2500m, rarely seen in groups of more than 4 or 5. Seedlings are seen on open ground at roadsides and landslip sites, generally sloping ground facing south to west. Mature trees within the tropical/cloud forest grow to 20m with a trunk of 40-75cm in diameter. At this size, the trunk is a mass of long, thick, closely spaced lenticels, giving 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. The bark between the lenticels is smooth, glossy whitish-grey to creamy-brown. At the base of mature trees the bark is heavily cracked and plated, with fewer lenticels. As mature trees are always found surrounded by other large trees, there are naturally no low branches. In these conditions, branching happens at about two-thirds height, with a light and open crown. Study of younger trees to 10m height in open arable land surrounding a farm showed that given space and light they will produce a broader spreading crown with major branch junctions happening much lower down the tree. It seemed that *B. cylindrostachya* were less common (difficult to differentiate from trunk studies alone). The smaller saplings we saw at low altitudes by the roadsides were probably *B. cylindrostachya* because of the number of teeth between vein-end teeth and also the twigs were very hairy. Higher up, the big trees were probably mostly *B. alnoides*. Some could definitely be identified as such by the autumn flowering.

Betula utilis appears from 2200m up to 3000m. There is some overlap with *B. alnoides* within the cloud forest. Higher in the temperate forest *Betula utilis* is the only birch. It stands amongst *Tsuga*, *Abies*, *Pinus*, *Quercus* and *Alnus* where you may see small groups of mature *B. utilis* dotted among the other trees, generally at least 3m apart (though a lone *B. utilis* will occasionally be seen growing literally alongside and touching a conifer). It is an attractive tree, the only one in this area with such a smooth, colourful trunk. Generally very straight-trunked and reaching heights of 15-20 metres, as it competes with its neighbours for the light. Seedlings can occasionally be found occupying recently land-slipped ground (Landslips are common in these steep sided valleys with high rainfall). The bark of mature *B. utilis* found in this area is always dark reddish-brown to purple. It is smooth and free-peeling in large sheets. At the base, the outer bark is thicker and cracks away in chunks whilst still retaining the colour and texture of the higher bark. Like the *B. alnoides* lower down, the *B. utilis* found in the forest have no low branches and branching only occurs at two-thirds height producing a thin, open crown. Younger trees found at and beyond the upper limit of the temperate forest had many lower branches and exhibited a much broader shape, though still quite a delicate tree. Higher up, as the forest becomes thinner and lower, the *B. utilis* change their character. They are shorter, rarely attaining a height of more than 10m. The bark is lighter in colour, showing more silver amongst the dark reds and browns. This increase in the betulin is thought to be a result of higher light levels reaching the trunk. At this altitude, the *B. utilis* can be found in groves in much larger numbers and closer grouping.

The highest altitude birch in this area is *Betula ashburneri*, found between 3000 to 3700m. This was an exciting discovery, as it was only known to exist in Tibet and Yunnan (see my update at the end of this article). Proof that it also exists in the Mishmi Hills of Arunachal Pradesh suggests that its spread is much wider than was realised. I expect we shall see it recognised across more of the Himalaya in the future. *B. ashburneri* here is generally a knarled, twisty multi-stemmed shrub; its shape evidence of the amount of snow its branches have to bear in the monsoon season and the level of exposure to severe weather. At the lowest end of its range, the tree can be quite upright, with fewer stems and a height of up to 5 metres. But as you move up the hills the shape changes noticeably to a truly multi-stemmed shrub of no more than 3 metres, with some of its lichen and moss covered branches being almost prostrate. The bark on these trees is grey-brown in colour and has a metallic shine. It is rougher than *B. utilis*, has very short lenticels and peels in thin tatters. On the slopes above the temperate forest belt *B. ashburneri* is a common tree, often

forming dense thickets or copses alongside *Acer*, *Rhododendron*, *Abies*, *Sorbus*, *Salix* and *Vaccinium*. Generally it occupies very rough, boulder strewn slopes or riverside sites. Even at these heights, amongst the rocks the litter layer is deep and there is plenty of moisture. One of the most interesting discoveries in this area were small trees found in two valleys at about 2900 metres. In both cases this was the cross-over area between the temperate forest *B. utilis* and the alpine *B. ashburneri*. A significance I didn't truly comprehend at the time. Having now studied the data collected in more detail, it is likely that these trees are a hybrid of the two species. What caught our eyes first was the unusual bark. It was grey-brown in colour, 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 between 6-8 metres high, but quite broad and spreading, sometimes with several stems (but not truly multi-stemmed). The leaves were *utilis*-like in shape, but much more hairy on the underside. The twigs were slightly rough and very hairy, again much more hairy than *B. utilis*. There were 10-14 leaf veins and the edges of the leaf were turned down in a way that made the teeth more visible from the side than the top - again, different to *B. utilis*. The ripened fruits were hanging and the fruit scales were very similar to *B. utilis*. But the male catkins were smoother than *B. utilis*. These trees were not common, but were interspersed with the smaller *B. utilis* mentioned earlier. Only a few trees were found, and only in a small corridor between other *betula* species. Therefore it seems unlikely that they are a separate species or even a variety. The conclusion is that we had come across a natural hybrid.

Update

In October 2012, I was fortunate to obtain the help of Dr. Richard Buggs from the School of Biological and Chemical Sciences at Queen Mary University of London. He oversaw the molecular analysis of material from the *Betula ashburneri* seedlings raised from seed collected on this expedition. Jaume Pellicer of Jodrell Laboratory at RBG Kew used a process called Flow Cytometry to measure the Genome size which enabled Richard to establish that the *Betula ashburneri* seedlings are indeed diploid ($2n = 28$). *Betula utilis* are tetraploid ($2n = 56$), so this proves that our trees are not *B. utilis*. Combining this scientific proof with the morphological characteristics (physical attributes) of the trees enables us to reasonably deduce that these trees are the same species as that first identified by Hugh McAllister and Keith Rushforth in Tibet in 1997.

Betula ashburneri photos showing morphology



Betula ashburneri showing typical multi-stemmed habit. Note horizontal to upright fruits on left side of tree.



Close up of fruits.



Stem of *B. ashburneri*



Young shoot of *B. ashburneri* showing many resinous glands on twig. Often pubescent as well. Leaves are similar to *B. utilis*.



Scales from fruit of *B. ashburneri*



Scales from fruit of *B. utilis*