Betula chichibuensis on a limestone outcrop in Saitama Prefecture.

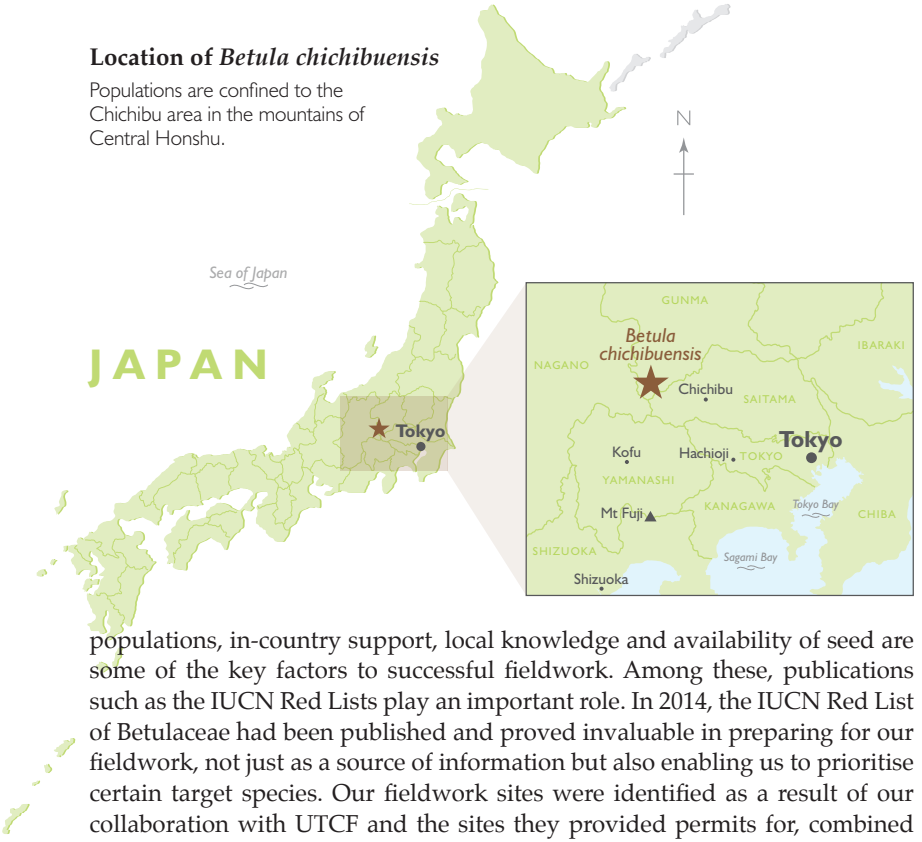
Betula chichibuensis

BEN JONES[1] writes about the conservation of a critically endangered Japanese birch.

Over the past few years I have been fortunate enough to spend time conducting fieldwork in the Chichibu Mountains, Saitama Prefecture, central Japan. The work being undertaken forms part of a long-term collaborative project, led by the University of Oxford Botanic Garden & Arboretum (OBGA). Working with Dan Luscombe, the National Pinetum Bedgebury and the University of Tokyo Forests Chichibu (UTFC), this work has involved conducting rapid botanical surveys (a method developed at the Department of Plant Sciences, University of Oxford), and the collection of plant material on or as near to those sample points where possible. Survey data collated from different sample points and seasons has supported the collections of plant material (shared with partners), as well as being utilised for ongoing research.

Japan is an archipelago of over 6,800 islands, supporting a flora of *ca.* 5,600 taxa, with 2,491 species being endemic. The prioritisation and collection of target species from a flora of such size, both in terms of distribution and diversity, can be a complex process. Consideration of a broad spectrum of factors, ranging from a Collection's development (in support of delivering visions, strategies and core activities of an organisation or plant collection), conservation, data sources (herbaria, Red Lists or local floras), access to key

[1] University of Oxford Botanic Garden & Arboretum.



populations, in-country support, local knowledge and availability of seed are some of the key factors to successful fieldwork. Among these, publications such as the IUCN Red Lists play an important role. In 2014, the IUCN Red List of Betulaceae had been published and proved invaluable in preparing for our fieldwork, not just as a source of information but also enabling us to prioritise certain target species. Our fieldwork sites were identified as a result of our collaboration with UTCF and the sites they provided permits for, combined with the presence of populations of key taxa that had been identified as being of high priority. The only known population of *Betula chichibuensis* sat within these areas and had recently been assessed as Critically Endangered (CR).

On a rainy late September morning, we met with colleagues from UTFC at the forest lodge where we were staying. Although plans for our fieldwork had been in discussion for several months, as with each morning of our time there whilst conducting fieldwork, we talked through the plans for the day. Based on weather forecasts, as well as knowledge and expertise of our Japanese colleagues joining us that day, it was decided that we would aim for the remote and isolated population of *Betula chichibuensis*. Despite the fact that very little seed had been observed on two previous visits to the population over the summer, it was still important to try and make it to the population. Even in the absence of seed, the population could be surveyed, as well as herbarium material and digital images taken. We would also encounter a number of target species on the way.

A short drive from the forest lodge, we arrived at a small car park. Looking at the topography around us and having been told that we were a good three

hour walk from the population, it was obvious we were in for a physically demanding day. Steep ridges rose from the deepest of river-filled gorges, with complete tree cover from top to bottom. Any concerns we might have had soon diminished as we started to make an initial climb into the forest; *Acer pictum, Meliosma myriantha, Gamblea innovans* and *Picea torano* were some of the many botanical highlights of the day as we made our way along a very narrow and winding path. Whilst the pace remained constant, the severity of drop to one side and the steepness of climb began to increase. The great thing about walking in this environment is that you always have the perfect excuse to stop and botanise, even if it's to catch your breath. The next three hours were filled with climbing but dropping occasionally to mountain streams in the initial stages; at lower altitudes, the dominant canopy comprised of *Pterocarya rhoifolia*, *Fraxinus platypoda* and *Cercidiphyllum japonicum*, with numerous of the latter attaining dimensions that could make you stop and stand in awe all day.

Walking through mixed temperate forests in Japan will always be an exhilarating experience; the diversity of plants, topography, shades of colour, sounds, but also the contradictory senses of the familiar and unfamiliar at the same time. The familiarity comes from seeing genera like *Betula, Juglans, Carpinus, Tilia, Alnus, Pinus, Quercus* and *Fagus,* whereas the unfamiliarity comes from being immersed in a flora where these genera are each represented by numerous species, to speak nothing of the other botanical highlights that accompany them. The number of species for the different genera are as follows:

Betula: 7	*Alnus*: 9	
Juglans: 2	*Pinus*: 7	
Carpinus: 5	*Quercus*: 15	
Tilia: 5	*Fagus*: 2	(Iwatsuki, K., et al. 2005)

Nearing the population and as altitude increases, the species composition transitions into something equally spectacular. *Abies homolepis, Trochodendron aralioides, Daphniphyllum macropodum, Pinus densiflora, Tsuga sieboldii, Acer nipponicum* and *Kalopanax pictus* are some of the very many highlights. As familiar as one may be with these species individually, observing their different forms and habits, growing together in their natural environment is both a privilege to witness and an invaluable learning experience in equal measure. Pushing on, we eventually made it to the population. A final steep climb saw us break through onto the beginning of a limestone outcrop and into the population of *Betula chichibuensis*.

At an altitude of 1,400 m, the population stretches across *ca.* 100 m of very steep, exposed limestone ridge. The form of individuals ranged from multi-stemmed shrubs to 10 to 12 m tall single stemmed trees forming the canopy in places. Amongst others, *Juniperus rigida, Enkianthus campanulatus, Chamaecyparis obtusa, Clethra barbinervis, Tsuga sieboldii* and *Acer pictum* accompanied

photograph © Ben Jones

Population of *Betula chichibuensis* extending out over rocky limestone outcrop in Saitama Prefecture.

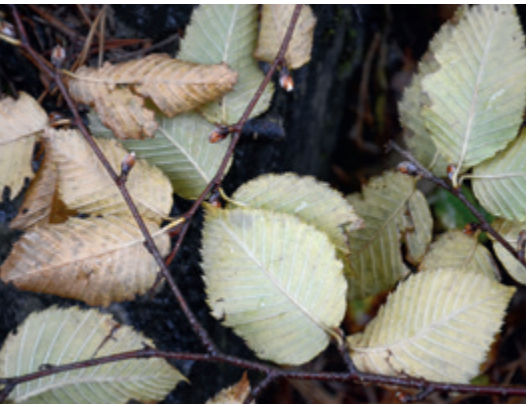
the *Betula chichibuensis*. After a well-earned lunch, we set about surveying the population and collecting plant material.

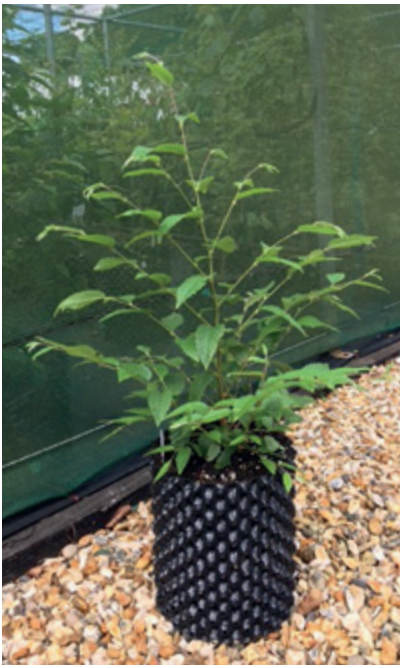
Over the next couple of hours, the team surveyed the extent of the population, which stretched over approximately 100 m. Individuals within the population that had seed were identified and collections were made. Seed was sparse, so we ensured that only *ca.* 10% of the total amount of seed present on any individual tree was collected and material was also collected from a number of species growing alongside the *Betula chichibuensis*. In addition to plant material collected for herbarium vouchers, plenty of digital images were taken to support data collected from the population. Surveys and collections completed, we began our return journey. Subsequent visits to Saitama Prefecture have identified at least two other populations of *Betula chichibuensis*. Over the past few years, over 100 plants have been grown from seed collected from distinct populations and will be secured in different collections. In part, this has been achieved as a result of the work carried out at the National Pinetum, Bedgebury. A reliable germination protocol has been developed and the plants have been propagated by Dan Luscombe (Curator) and his team.

Grown from seed collected under permit, in collaboration with Japanese and UK partners, supported by a wealth of field data and seed material conserved at the Millennium Seed Bank Project at Wakehurst Place, plants have now been planted at OBGA and other gardens and arboreta across Britain. The new plantings at OBGA will strengthen the collections by contributing to both the aesthetic and scientific elements of our living collections. On one level, these

Opposite far left, mature foliage of *Betula chichibuensis*, and **right**, male and female catkins.

Below, the attractive white underside of *Betula chichibuensis* leaves.





photographs © Ben Jones

A propagated plant of *Betula chichibuensis*.

plants form part of the picturesque landscape at the arboretum and provide a stunning buttery yellow scene during the autumn. Equally, these well documented living *ex situ* conservation collections will extend and support our research, teaching and engagement activities.

The birches (*Betula*) are deciduous trees and shrubs with alternate leaves and unisexual flowers produced on catkins being borne on the same tree. (Bean, W. J., 1978). Birches, especially those with white bark, are one of the most popular groups of trees (ornamentally), valued for their elegance of habit, the colours of their bark and leaves, their usually rapid growth and comparatively small size (Grimshaw, J., *et al* 2009). The genus *Betula* contains trees and shrubs from diverse habitats in boreal and temperate climate zones of the Northern Hemisphere. The genus is placed within the Betulaceae family of the order Fagales (Schenk, M. F., *et al* 2008). One hundred and two species of *Betula* are recognised in the World Checklist of Fagales (Govaerts & Frodin 1998), distributed across the Northern Hemisphere. The number of species is, however, widely disputed: species delimitation is problematic, and hybridisation is rampant (Grimshaw, J., *et al* 2009).

Betula chichibuensis is the World's rarest birch species, assessed as Critically Endangered (CR) (Shaw, K., et al 2014). Endemic to Japan, and with a very small extent of occurrence, it is confined to the Chichibu area in the mountains of Central Honshu. It occurs as subpopulations and the

Above left, *Betula chichibuensis* bark and **right**, semi-mature individuals, on an exposed ridge.

area of occupancy is estimated to be very low (<10 km²). The population was reported to have just 21 individuals remaining in the wild in 1993. (Shaw, K., et al 2014). Over the next few years in particular, efforts will continue on this species, working closely with the Global Trees Campaign.

Distinct with its soft ovate leaves, with up to 18 pairs of impressed lateral veins, clusters of numerous male catkins from several buds towards the ends of the twigs, and short, upright fruiting catkins with wingless seed. (Ashburner, K., et al 2013). Creamy yellow male catkins and red female catkins with tufts of violet styles provide spring interest, leading through to the autumn, when the leaves turn a butter yellow. Even in the depths of winter and in the absence of foliage, the stems and branches with their prominent lenticels provide a degree of interest.

References

Iwatsuki, K., Boufford, D. E. & Ohba, H. (2005). *Flora of Japan. (IIa) Angiospermae, Dicotyledoneae, Archichlamydeae.* Tokyo, Kodansha.550+xiii pp.

Shaw, K., Stritch, L., Rivers, M., Roy, S., Wilson, B. and Govaerts, R. (2014). *The Red List of Betulaceae*. BGCI. Richmond. UK.

Ashburner, K., McAllister, H. A., (2013). *The Genus* Betula. *A Taxonomic revision of Birches.* Kew Publishing, Royal Botanic Gardens Kew.

Govaerts, R., Frodin, D. G., (1998). *World Checklist and Bibliography of Fagales (Betulaceae, Corylaceae, Fagaceae and Ticodendraceae)* Kew, Royal Botanic Gardens.

Grimshaw, J., Bayton, R. (2009). *New Trees: Recent Introductions to Cultivation*. Kew Publishing, Royal Botanic Gardens Kew.