

2012 Plant study expedition to Georgia Caucasus

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Acknowledgements

I would like to thank the following people and organisations:-

For financial support:

These organisations provided the funds for me to carry out the expedition.

The Royal Horticultural Society Bursaries Committee

The Percy Sladen Memorial Fund

The Stanley Smith (UK) Horticultural Trust

Plant Heritage Devon Group

Royal Forestry Society Randle Travel Fund

June Ashburner and the Trustees of Stone Lane Gardens – for help and encouragement.

Dr Hugh McAllister, Dr Martyn Rix and Keith Rushforth – for references, advice, and their expertise.

Tbilisi Botanic Garden – for their constant support in Georgia, particularly Manana Khutsishvili (Head of Herbarium) and our driver Temuri Siukaev.

David Kharazishvili (Batumi Botanic Garden) for looking after us in Adjara.

The Georgian Army team at the Mt Tbeti border post for transporting us to our hunting ground.

Rachel Short – for putting up with endless trees, trees, trees. Not to mention my illness.

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2012 Plant study expedition to Georgia in the Caucasus region.

Expedition Leader: Paul Bartlett

Other members: Manana Khutsishvili (Head of Herbarium, Tbilisi Botanic Garden)

Overview

A Plant Study expedition to Georgia in the Caucasus mountains in co-operation with the Tbilisi Botanic Garden (Georgia), to study the rare birch trees unique to this mountainous country and learn more about their habitats in the wild.

Aims and Objectives

1. To research the poorly studied *Betula* species native to Georgia, to gain a better understanding of their characteristics, distribution and habitat.
2. In particular, to study the relatively rare *Betula medwedewii*, *Betula megrilica* and *Betula raddeana* that are only found in this region.
3. To further define the characteristics and habitat of *B. medwedewii* and the very rare *B. megrelica* , so that we can more clearly understand the differences between them.
4. To collect data, photographic evidence, material for chromosome study and to collect seed for propagating in the UK for distribution to Botanic Gardens (see notes below).
5. In partnership with Tbilisi Botanic Garden to map the distribution of Birch and Alder in Georgia.
6. To establish the presence of other previously overlooked shrubby birch and alder in the region.
7. To establish contact with the Tbilisi botanic garden in Georgia. To begin a partnership with this establishment to better communicate research and knowledge of this botanically diverse and under-studied country with the wider horticultural community. To encourage future cooperation and exchanges.

Notes:

By studying trees in a variety of provenances (and micro-climates) within Georgia, it is hoped that I will find trees suitable for growing in the UK climate. Hopefully some of these provenances may eventually replace less suitable provenances currently growing in the UK. It is also hoped that we may find trees of more attractive character, which can be introduced for garden planting.

The botanists of Tbilisi Botanic Garden agreed to help me obtain the necessary permissions and phyto-sanitary certificates, which allowed me to export material from Georgia for study in the UK.

Itinerary

Throughout this document I will refer to the locations by the Area numbers found on the map in Appendix 4

Wednesday 5th September – Travelled from Devon to Heathrow for flight to Tbilisi via Baku. Arrived in Tbilisi, Georgia at midnight. Met by Manana Khutsishvili (head of Herbarium, Tbilisi Botanic Garden) and our driver Temuri (who is the driver for the head of the Georgian Botanical Institute). Taken to Hotel in Tbilisi.

Thursday 6th September – Picked up by Manana and Temuri and taken to the herbarium at Tbilisi Botanic Garden. Given tour of herbarium (which was funded by the Georgian millionaire who has just become Georgia's new Prime Minister). Amazing new building. Looked at the herbarium voucher specimens for the birch in Georgia, some as old as the start of the 20th century. Discussed the itinerary and looked at maps to better understand the weeks ahead. Packed everything into our car, which is a 4 wheel drive car apparently funded by the Kew Millenium Seedbank project. After lunch, headed off to the region of Samegrelo (Mingrelia) **Area 1**.



Temuri and Manana

5 hour drive west from Tbilisi, firstly along the main river valley and plains, then up into the hills towards Kutaisi. Then higher into the hills north west of Kutaisi to our base in the town of Tsalenjikha. Arrived in evening at our homestay. Joined for dinner by the lady who owns the house (who didn't speak any English but was very charming) and also by the man who will drive us into the hills and guide us there. His name is Bejan, a local forester. Temuri and I polished off a complimentary pitcher of local wine given by the house owner.

Friday 7th September – What an exhausting day! Only a few lines entered in my diary for today, as I was too tired to complete it in the evening. Hardly slept last night because of local idiotic teenagers blasting car horns in the square all night, as well as someone ringing the doorbell at

3am! Up at 5.30am and straight into car to meet Bejan at road-head a few miles away. 4 hour truck ride in Bejan's ancient, but very robust, Russian six wheel open backed truck. Firstly along the side of a deep, steep sided Gorge, then zig zagging up the side of the mountains. Forestry track is very stony and uneven with bends so tight the truck has to execute 5 point turns to get round. Massive trenches gouged out of track mean that the truck is constantly bouncing around at



worrying angles. Very uncomfortable in cab with Manana and Bejan. Temuri in back of truck with other helpers of Bejan. (and anyone we pick up along the way!). Parked at height where Beech forest very evident. Walked up hill-side through Beech and Rhododendron spp. Then reached tree-line where *Sorbus* (white-beam) and *Picea orientalis* (Spruce) were prevalent. Hill-side covered in a chest high scrub of Rhododendron, mostly *R. luteum*, which made movement away from the paths difficult. Some small multi-stemmed shrubs

were spotted off one of the paths, which had to be approached by wading through the rhododendron. Manana at first thought these must be a birch, but I was less convinced. The stems did look like birch, with many lenticels and similar twigs, but the leaves didn't look right. Further investigation revealed a few fruits, which confirmed my suspicion that it was a dwarf shrubby white-beam. Later we identified this as *Sorbus graeca*. We encountered tree birch at this height (approx. 2200m). Trees with a white bark when mature, up to 40 feet high, but mostly smaller. Lots of seedlings of great variety in leaf and twig. These fitted the herbarium specimens of *Betula litwinowii*. Seed collected. Beautiful mountain scenery and many wild-flowers. Carpets of Crocus and Gentian in places. Ended up back at truck late afternoon, after a walk of about 8 miles. The hideously uncomfortable 4 hour truck ride back down the mountain ended in the darkness, illuminated only after Bejan grabbed two bare wires sticking out of the dashboard and twisted them



together. Dinner back at the homestay after a shower, consisted of tinned fish, meat and bread. And a bottle of Georgian beer. Very tiring day, but also very interesting.

Saturday 8th September – Drove to a town called Jvari to find a mountain of the same name that is one of the original locations for *Betula megrelica*. After discussions with a local forester it turned out that this mountain is in fact next to Mt. Migaria, which we are visiting tomorrow. So now had a day free. Manana decided to take me into the Svaneti district (Area 2) as we were right on the border with it. This is a lovely high mountain region bordering Russia. Great peaks all around, mostly between 3000-4000m. Lots of snow on the tops and big glaciers tumbling into the valleys. Attractive buildings with the typical Svaneti defensive towers by every hamlet. We found many birch by the road-side. These looked like the *B. litwinowii* we had seen yesterday, but some were more pendulous, more akin to *B. pendula*. Also found *Alnus barbata* and higher up *Alnus incana*. This is the furthest south I have seen incana. Seed collected. Lunch in town of Mestia, deep in Svaneti. Started to realise that food in Georgia consists of lots of bread and cooked cheese. But fresh tomatoes and fruit are lovely. Managed to avoid death by dangerous Georgian drivers (of which there are plenty). Returned to homestay on road that passed field after field of abandoned tea plantations. Not cammelia, but some other plant.

Sunday 9th September – Off to Mt. Migaria today in Bejan's truck again. Up at 6am, then 2 hour bumpy ride up to the col between Mt Migaria and Mt Jvari. Not a comfortable ride, but much quicker than two days ago. Bejan led us to the spot where he found the shrub birch and there it was! A 2 foot high poor specimen that was being grazed to the ground. He and Manana said it was twice the height a little while ago, so the goat grazing damage is very apparent. No seed. Multi-stemmed and looks just like *Betula medwedewii* – no discernable difference. Demonstrated wintergreen smell to Bejan, who hadn't noticed this characteristic. Looked around immediate area but saw no other birch. Drove slightly further on and started searching tree-line area on the other side of Mt. Jvari. Lots of small Hazel that from a distance look just like birch. Just as well I have the binoculars. Saves a lot of wasted scrambling to distant shrubs. After a while Bejan came back from walking ahead of us with news that he had found more birch. Sure enough there was an area of steeply sloping grassy hillside with many *Betula medwedewii* dotted around. These shrubs were mostly about 2-4 feet high. A lot had been grazed, but not all. Found only one fruiting cone. Took scion wood. Tried to find older trees, but there didn't appear to be any. Lots of domesticated goats around here, as shepherds have hut nearby and make cheese from their milk. Stopped at Shepherds hut on way back to buy cheese. Bejan is on good terms with them. He and Manana both bought cheese. It is made in the hut and then boiled in milk in a big pan. Very cosy smoke filled hut. Shepherds very friendly, but we were in a hurry to get down so couldn't stay long. The alpine meadow around the hut is covered in crocuses. Met Temuri back at the road and said good-bye to Bejan. Drove back to Tbilisi – long drive, got back at 8pm. Discovered that room in homestay I had booked had been given to someone else. So hurried search for a nearby room. Ended up in big apartment that would have been lovely if things had worked properly and not felt as though they were all falling apart. Too tired to argue about it. Quick shower and then Manana and Temuri picked me up to meet my partner Rachel at the airport. She is joining me for the rest of the trip.

Monday 10th September – Relaxed day in Tbilisi wandering around the city. But started feeling ill in afternoon. Fever turned into diarrhea in the night. On and off loo all night long. Must have been something I ate or drank. Hardly slept and subsequently neither did Rachel.

Tuesday 11th September – Felt grotty in morning. Packed and then picked up by Manana and Temuri for journey north to Kazbegi (Area 3). Stopped off at some ancient monastery and church. Very dramatic location on hill-side. Suddenly realised seed collection had been left in apartment.

Phoned owner but everything had been thrown out and collected by bin-men. Couldn't believe it. All that effort wasted. Luckily nothing was lost that couldn't be replaced later in the trip. And I still had all the written records and photos. But still a big loss and very disheartening. It was really my illness and tiredness that had caused me to be careless with the packing at the apartment. But for the rest of the expedition I kept the seed bag in the rucksack at all times. Stopped on way to Kazbegi to watch a big gathering of traditional dancers and musicians. Amazing dancing, the boys are really acrobatic and the girls costumes are so decorative. Interesting music and singing. Eventually got to Kazbegi in early evening. Lovely scenery but then cloud came down to ground level. Good accommodation in former Field station of the botany institute. Now turned into hotel. Good food in evening, but I am still not feeling like eating much. Just keep taking the immodium.

Wednesday 12th September – Woke up to a beautiful sunny morning. All the big mountains are clear of cloud and the scenery is incredible. Steep snow covered summits, glaciers, waterfalls.



Real high mountain scenery. Mt Kazbeg is just above the town and is the highest mountain for miles (5000m). After breakfast drove to the border with Russia. Found birch in several places. Seed collected. Looks like *B. litwinowii* again. Then visited Gveleti gorge and waterfall. Interesting birch here that have very downy heart-shaped leaves. But no seed. Then on to Gergetis Sameba church sitting isolated on rock above town. Lovely old church (and lots of tourists). Beautiful day. Had lunch in alpine meadow near church. Then walked down to town through Crook-stem birch woods. *B. litwinowii* again. Interesting woods with great variation in tree size and characteristics as you descend. No sign of *B. raddeana* though, which is a real disappointment. The trouble is, *raddeana* and *litwinowii* are very similar in character, so it is going to be difficult spotting them. And we know very little about their habitat. Today has been more relaxing, and this makes me realise I am trying to cram too much into this trip. The itinerary is far too full and we are having to travel constantly to keep up with the schedule. This isn't helping my illness as my body is getting no time to rest. Every time I stop taking immodium, the diarrhea returns.

Thursday 13th September – didn't sleep well last night – stomach cramps and diarrhea. Rachel not feeling well either. Decided to re-visit Gveleti gorge as the birch there had been interesting and I wanted to study them more. Left Rachel at hotel to rest and recover. Found more of the downy birch but again no seed, despite finding more mature trees. Interestingly I discovered that it is only

new growth that has downy leaves. Old growth is more like *litwinowii*. So maybe I am being fooled by this characteristic. Need to grow plants from seed to study this more. Took scion wood. Climbed further up valley side on scree to look at higher birch woodland. This is all multi-stem trees that have rougher bark with tighter lenticels and fatter spikey fruits. Surely this was *B. raddeana*. This was certainly my immediate impression and it pays to follow gut instincts (though possibly bad choice of phrase given my predicament). Collected plenty of seed (all high up in the trees). Returned to hotel to pick up Rachel who was still looking poorly. Then straight back to Tbilisi with no diversions, as neither of us felt well. Decided to stay at nicer hotel in Tbilisi, as we were both tired and under the weather. And it was nice to be comfortable after such a lot of driving and pressure to find the trees. Rachel felt better by evening. Visited Turkish baths in Tbilisi in early evening, very hot. All heated by natural springs. City looking lovely at night with all the lights on the old buildings and bridges.

Friday 14th September – Temuri picked me up from hotel in morning. After picking up Manana, taken to police building to pay for phyto-sanitary permit. Then off to nearby building to pick up permit. Awkward staff, no smiles, just very officious. Luckily Manana knew one of the staff and he smoothed things out for us. Then off to Border Police department to let them know we would be travelling into Turkish border zone in Adjara. Back at hotel by lunch-time. Had lazy afternoon wandering around Tbilisi. Had dinner in square below hotel at Georgian restaurant. Ordered chicken with vegetables and potatoes. Massive meal arrived including a WHOLE chicken stuffed with walnut sauce. Wasn't feeling very hungry anyway, but there was no way I could eat all that. Waiter bagged the majority of it and we walked up the road until we found a beggar (there are a lot of beggars in Tbilisi) and gave the chicken to her.

Saturday 15th September – Up early to travel to Batumi on the Black Sea coast (Area 4). Long, long drive. Stopped at Kutaisi, which is about halfway. Looked around lovely old church just outside city. Used to be the Georgian equivalent of Cambridge, with a place of learning here. King David the builder is buried here. His grave lies at entrance. Then into city to see newly rebuilt main church. As luck would have it, the Patriarch of Georgia was just finishing an opening ceremony there. Lots of people gathered, lots of photographers, lots of earnest men in black with big beards. The drive was much easier after Kutaisi, as the land flattens into a low plain. Roads straighter and wider. Quick stop for lunch at café. Fresh fish. Really delicious. Shortly after we saw the sea! Lovely sunny day and the sea is sparkling. Batumi looks lovely and is full of modern buildings and renovations. Walked to beach in afternoon. Really attractive city, much nicer than Tbilisi. Had meal in evening with Manana and Temuri, but my bowels are still no better. I am on the Immodium all day when we are travelling but don't want to take it all the time. Consequence is really dodgy bowels in evening. This illness has been dragging on too long now. Talked it over with Rachel and decided to see doctor day after tomorrow.

Sunday 16th September – Today I was up early (too early for breakfast) to be taken into the mountains inland of Batumi near the Turkish border. Our local guide David Kharazishvili works at the Batumi Botanic Garden (which apparently is a lovely garden, though I didn't have time to see it). He and a colleague called Nino are showing Manana and I where *Betula medwedewii* can be found. First stop was a friend of David's who gave me a herbal remedy for the diarrhea. Pomegranate juice and herbs. Nice old man who didn't want any money, just glad to help me. The Georgians are like that, very welcoming and friendly. Then off to hills. Long ride up a very attractive valley following a big river. The sort of river that you expect to see people fly fishing in. Very rocky and rapid, but not too deep. After about an hour and a half, we left road and continued

up bumpy track past several small villages. Last village is highest in Adjara. Then stopped at army checkpoint and barracks. This is border post. David stayed here when studying plants a few years



ago.

Temuri, Nino, Manana, Army officer and David

One of the army officers drove us on from here in their pickup. We are above tree-line here. Lovely alpine meadows. Covered in crocus and gentians. After walking for a short while, I saw birch-like shrubs just off the path. Sure enough they were a small group of *Betula medwedewii*. My main reason for coming so far and all that travelling was growing happily in front of me. I was amazed how small they were, but in very healthy condition. And there were so few of them. Shrubs of 6-8 feet in height. All multi-stemmed. No big stems. Much smaller than they grow in the UK. Talks with David confirmed that *medwedewii* is actually very rare in Georgia. He only knows of one other place it grows in Adjara. And he confirmed it doesn't grow much bigger than the group we saw. So the cold, frozen snowy winters keep it low. And it can't compete with the faster growing competitors at lower elevations. This is why I needed to come and study them. You can't get a true understanding of a plants natural interaction with its environment by looking at trees in a garden. The scenery is amazing. It is a beautiful sunny day (like most have been). The mountains stretch over into Turkey. The ridge we are on joins another ridge just ahead and that is the border. So *medwedewii* will most likely occur in Turkey as well. On journey back saw car in front with two calves in the boot. Got back to Batumi at 7pm. Bad news from Rachel. She tried to book Tbilisi hotel for our return, but they are all full. And now we were struggling to find room for our return. So Rachel booked a more expensive hotel than we could really afford. We are hoping we can change to a cheaper one, once we get back.

Monday 17th September – Taken to hospital this morning to see doctor. David came with us, which was very nice of him. Very shabby building that didn't instil confidence. Doctor decided I needed

blood test. But also gave me transfusion! I was a bit nervous of how clean their equipment would be, but in fact they were very hygienic. A nurse put a cannula in my arm and then gave me two bags of what looked like saline. I think it was a mix of water and electrolytes. So I had to lie in bed for an hour or so while that slowly fed into my arm. All hospital staff good and quite friendly – and all women. Back to the hotel by lunch-time, after picking up medication from chemist. 3 different medicines to take. Rachel glad to see me I think. She said the text from me saying 'Just having transfusion in hospital' was one of my more unusual ones. Rented 'Boris Bikes' for quick pedal along sea-front (well you didn't think I was going to go and lie down, did you!). Light lunch of cheesy bread and half cooked eggs floating in a bowl shaped piece of bread. It's not healthy eating is it? Then lazy afternoon and gentle swim in Black Sea. Quite warm but not as warm as I thought it would be. Out for dinner with Manana, Temuri and David in evening. Nice location and very good company. David makes good host and played the part of Toast master 'Tomada'. Lots of toasts. It would have been more fun if I could have joined in fully with the toasts, but too much alcohol would not be good. Dancers were performing for coach party of Polish. Excellent dancers and singers. Sad to be leaving Batumi. Could easily spend a week here.

Tuesday 18th September – Nice breakfast on the roof terrace this morning. Then off to repeat the road up the lovely valley I took two days ago. This is the scenic route to Bakuriani. Over high alpine pass. Usual stunning alpine scenery. The beech trees are starting to turn colour. Saw a bus



full of cows as we descended the pass ! It could only happen in Georgia. Arrived at Bakuriani (Area 5) at 6pm. Another day of driving. It starts to get to you after a while. Manana pointed out whole mountain-side where forest has been burnt. This was caused by Russian planes bombing the area in 2008. Nice small hotel at Bakuriani. Good simple filling meal in evening. Borsch soup to start. Made a change from Kachapuri.

Wednesday 19th September – Large breakfast that included wheat grain and fried chicken. Then headed off up the road to the top of the mountains. Rachel stayed in Bakuriani. Found *Betula litwinowii* as we climbed, but no *raddeana*. Another lovely sunny day that makes you glad to be alive. Ended up climbing around in the birch, supposedly to get seed, but really just for the hell of it. Then picked up Rachel and headed down towards Tbilisi. Stopped at ancient cave city near Gori. Very hot and arid, so different from the mountains. Then lovely cathedral at Mtskheta. Beautiful old building. Arrived in Tbilisi 5.30pm. Found cheaper hotel for the next two nights.

Lovely meal in evening on one of the attractive side streets. Bought present for Manana. Lovely river-side walk in evening.

Thursday 20th September – Walked up to the Botanic Garden to see Manana for the last time. She is leaving today to visit her sister in the east of Georgia to help with grape harvest. Showed Rachel the herbarium. Had a last look at some voucher specimens to verify a few things. They have some old specimens labelled as *medwedewii* that are definitely not. In fact I don't think they are birch at all. But they are so dried and difficult to identify. Gave Manana present and thanked her for looking after us. Very sad to say goodbye. Looked around shops and art museum in afternoon. Chilled out in hotel. Got trousers mended.

Friday 21st September – Nice breakfast. Last day in Tbilisi. Day of culture. Taxi ride out to ethnoculture museum. Amazing. Real old traditional buildings from all over Georgia that have been taken apart and re-erected in Tbilisi. Visited National Museum to see old religious treasures. Bit of shopping for Georgian music etc. Saw lovely Cloissone enamel jewellery.

Saturday 22nd September – Woken by alarm at 2.30am. Picked up by Temuri for transit to Airport. Said goodbye to Temuri and gave him presents for him and his grand-daughter. Easy but long flight back home via Baku. Cold and sunny at Heathrow (9 degrees, brrr) Forecast of rain tomorrow. Welcome back to England!

Achievements

The following section deals with the birch and alder that I found during the expedition.

The birch and alder of Georgia (Caucasus)

Being a mainly mountainous country, Georgia has many habitats that are suitable for birch and alder. Birch are encountered in and above the tree-line; which usually consists of Beech, rhododendron, fir, spruce and white-beam. Willow is also seen in this zone, but like the birch, is usually more common just above this zone. In Georgia, Birch are never present below the tree-line. Generally they are encountered between 2000 – 2500 metres.

Betula litwinowii

The birch normally seen, is a tree that the Georgians refer to as *Betula litwinowii*. Herbarium specimens of this species look like *Betula pendula* or *Betula raddeana*. Particularly the leaf shape. *B. litwinowii* certainly grows in rocky terrain that you would normally associate with the *Betula pendula* of southern Europe. I studied wild populations in 5 different parts of Georgia. Its fairly slender growth certainly reminds one of *Betula pendula*. However, it is usually defined as a subspecies of *Betula pubescens*. Clearly, chromosome counts of any seedlings that germinate from my seed collections will establish which species it is most closely related to. There is a lot of variation in leaf shape, twigs and buds. But the fruiting bodies are all quite similar. Current seasons twigs are generally glabrous or glandulous, but can be mildly pubescent. Bud shape can vary from pointed to blunt, but they are usually small. Leaf shape is generally rhomboid, but can be deltoid. Vein-end teeth are usually larger than secondary teeth, of which there are normally only 2 or 3 between vein-end teeth. But sometimes leaves can be seen with no differentiation between teeth. The rhomboid leaves do look very similar to the *B. raddeana* that grow at Stone Lane Gardens. So differentiation in the wild is not easy. Just above the tree-line, the birch are normally single stemmed trees up to 12 metres tall, though mostly shorter. But at the top end of their range, they form multi-stemmed shrubs of 3 metres or less. They are sporadic in the hill-side, but generally form small copses along ridges, growing out of steep cliffs or clustered along a stream. Clearly they grow better where they can find moisture during the dry summers, but you could not call them a moisture-loving plant. Indeed you do not see *Betula litwinowii* in flatter boggy areas (this is the habitat of *salix spp*); suggesting they need soil with good drainage. High up, they can form woodland of twisted, multi-stemmed trees known as Crook-stem forest. This is common on the valley sides above Kazbegi (Area 3), and also seen above Bakuriani (Area 5). It is less common in the mountains of Adjara (Area 4) and Mingrelia (Area 1). In the former areas, there is less other vegetation, suggesting that winters are harsh. In the latter areas, vegetation up to the tree line is much richer, suggesting milder winters. It could also be that trees have been coppiced in the past, but the trees I saw did not look coppiced. There was no evidence of growth from stumps. This looked like natural multi-stemmed growth brought about by local climatic conditions.

One interesting characteristic of the *Betula litwinowii* around Kazbegi is the presence of very downy leaves. This tends to be present only on vigorous young growth at the base of a tree or adventitious growth where damage had occurred. More mature growth on the same trees shows leaves with the normal characteristics. I did not notice this characteristic on trees in any other area.

Betula raddeana

This is another species of Birch that has been reported in Georgia. There is very little detailed description of this species available. Some of the herbarium specimens seen in Tbilisi are almost certainly *Betula litwinowii*. Indeed the two species are so similar that previous reports of *B. raddeana* must be treated with a certain degree of scepticism. The great degree of natural variation within *Betula litwinowii* would lead many casual observers to assume they were looking at separate species and so erroneously label that variation as belonging to *B. raddeana*.

I saw one wild population of what I think is *Betula raddeana* near Kazbegi (Area 3), in a woodland just above a large population of *Betula litwinowii*. The woodland was growing on steep scree on the side of a gorge. These trees appeared instantly different from the *B. litwinowii* I had studied just below. Firstly, the lenticels on the stems appeared to be much closer spaced vertically. This was a feature I had noticed in Stone Lane Gardens. Secondly, the bark was generally darker on new growth (though very pale on thicker stems) and also rougher in appearance with a lot of peeling in tight tatters not dissimilar to *B. dahurica* (though much less extreme). As previously stated, the twigs and leaves appeared very similar to *B. litwinowii*, but the fruiting bodies were broader and slightly spikier (though I think this last characteristic is a bit too vague to be distinct). One difference of the twigs was noticeable on previous seasons growth. On *B. litwinowii* this tended to be covered in a peeling greyish film. On *B. raddeana* this grey film was completely absent. The real clincher appeared on closer examination of the fruiting bodies. The scales are distinctly different to all the *B. litwinowii* I have studied. The 3 lobes separate at the base of the scale (rather than half way up), The outer lobes are straight and end in a narrowly spatulate shape (rather than curving outwards and ending in a broad fan). The seed of these trees is distinctly hairy at the upper end (rather than having very few or no hairs). I saw several other Birch in Samegrelo (Area 1) and Kazbegi (Area 3) that could have been *B. raddeana*, but I remain unconvinced. We need the results of chromosome counting before any conclusions can be drawn.

Betula medwedewii

This elusive shrub probably rates as one of the rarest of birches. Wild populations are only known to exist in the Caucasus region. It is considered a relict species. That is, an ancient species that has evolved in isolation and has therefore not suffered from introgression with neighbouring species. *Betula medwedewii* is indeed a very distinct species, superficially more like a shrub alder than a birch. It can be found in several Botanic Gardens in the UK, and a small number have been grown and sold by specialist nurseries such as Stone Lane Gardens. But it is still unusual to see it grown in the UK. However, I had not expected it to be so rare within Georgia. From discussions with Georgian botanists working for both Tbilisi and Batumi Botanic Gardens, it would appear to exist in Georgia only in very small populations in a couple of areas of Adjara (Area 4), and one area of Samegrelo (Area 1). From an ecologist's point of view, these small populations are very fragile and unstable. The threat of destruction of such small populations is great, especially in a country with a poor economy and little control of forestry and farming activities. Threats come from over-grazing of livestock, forestry activities and forest fires. *Betula medwedewii* has very specific growing requirements. It needs an area with no shade as it is not shade tolerant. It cannot compete with fast growing trees or shrubs as it is quite slow growing. It prefers a limestone based soil. This limits its range to cleared ground above the tree-line where there is little competition and the right soil. But it cannot survive too high because of the harsh winter climate. And it's slow growth makes it very vulnerable to grazing by both wild and domesticated animals. Seed dispersal is hampered by grazing, which destroys the fruiting bodies located near the growing tips (It is unlikely that the fragile seed can withstand an animals digestive acids and pass out in faeces

intact) . And just to add to it's woes, *B. medwedewii* seed cannot be dispersed very far as it lacks wings.

A potentially rarer birch exists in Georgia; *Betula megrelica*. This is a shrub birch almost identical to *Betula medwedewii*, differing only in the smaller leaf size, more stunted growth and a different chromosome number. It is only known from one shrub in Moscow botanic garden, which came from Mt Migaria. One of the aims of my expedition was to locate it on Mt Migaria (Samegrelo district – Area 1). This I failed to do, though I did find *Betula medwedewii* there and on neighbouring Mt Jvari. Tellingly, Skvortsov also failed to find *Betula megrelica* on Mt Migaria. All his seed turned out to be *B. medwedewii*. Having seen how rare *Betula medwedewii* is in the wild, it is my belief that the shrub known as *B. megrelica* is a chance hybrid of *B. medwedewii*. This may account for the variation in characteristics of seedlings from the parent tree in Moscow. It would be interesting to repeat the chromosome counts for the examples growing in Ness.

I do not see my failure to find *B. megrelica* as a set-back, but rather a further indication that it possibly does not exist in the wild as a separate species.

I found one specimen of *Betula medwedewii* on the upper slopes of Mt Migaria, at the edge of the tree-line where the spaces between trees become greater. This was a very poor shrub, 45cm in height, multi-stemmed with a diameter of 1.5 cm at the base. It had been damaged by grazing; probably by a herd of domesticated goats kept in that area. We then moved a little further up the mountain and onto the slopes of Mt Jvari. We found *B. medwedewii* in one small area of steep open hillside about 200m x 200m. These shrubs were between 30-120 cm tall, mostly multi-stemmed and some showing signs of grazing damage. There were no shrubs in that area bigger than this. They were growing on a grassy slope just below a steep limestone cliff, with *Sorbus graeca*, *Salix espae*, *Rhododendron luteum*, *Picea orientalis* and *Fagus orientalis*. Only one specimen had any fruit (just one fruiting body).

The other area in which I found and studied *Betula medwedewii* was Adjara (Area 4). Here I was taken to the site of a small wild population high on the slopes of Mt Tbeti on the Georgian /Turkish border. Here the trees were 180-240cm high, multi-stemmed with a diameter of 5cm at the base. These trees looked very healthy with plenty of upright fruiting cones. There was no sign of grazing damage in this location, but the shrubs were confined to a very small area of no more than 100 x 50 metres. Our guides from the Batumi Botanic Garden had only seen one other wild population in Adjara and had not seen any shrubs bigger than these.

***Alnus* spp.**

In addition to the Birch, I also studied the Alder of Georgia. I only saw two alder in the mountains. *Alnus barbata* on the lower slopes and along watercourses in the higher valleys. And *Alnus incana* higher up the hill-sides (though not as common as the birch). Generally *A. incana* did not appear in the same areas as *Betula litwinowii*, but slightly below it. Neither the *A. barbata* nor the *A. incana* grew to any great stature. *A. barbata* grows to a large size in the UK, with very rugged bark. But the Georgian trees were much smaller and with smoother bark. The *A. incana* are always slender trees, but were also shorter in Georgia.

I did not see any alder in the lower, more arid valleys anywhere in Georgia. It does not appear as a common riverside tree in the more arid lowlands, but appears to be confined to moist valleys and the hills above them. The herbarium in Tbilisi has many examples of *Alnus subcordata* and so I

was surprised not to find it. However, on closer examination of the notes with the specimens it was discovered they all originated from Azerbaijan (well it is all written in Georgian!).

Despite thorough searches across a large area of Georgia, I failed to find any shrubby alders. I had hoped to find a multi-stemmed alder in the high mountains, as it seemed reasonable to expect to find a relative of *Alnus viridis*, given the climate and landscape. But it appears that no shrub alders exist in Georgia.

Caveat

Before any firm conclusions can be drawn from my studies, it is necessary to back up my research with chromosome counting of any seedlings that I manage to propagate. It will be interesting to see whether *B. litwinowii* is a diploid (and therefore related to *B. pendula*) or a tetraploid (related to *B. pubescens*). Will some of the *B. litwinowii* prove to be hybrids? *Betula raddeana* should be hexaploid. And will all the *medwedewii* have the same chromosome count and will it match the *medwedewii* already in cultivation?

Summary

Overall, I think the expedition was a success and that I achieved most of my objectives. I travelled to 5 areas in Georgia. Firstly to Samegrelo district in the north west (Area 1), then further north to the border district of Svaneti (Area 2). Then the central northern area of Kazbegi (Area 3) After that we travelled south west to the Black sea region of Adjara (Area 4) before heading back to Tbilisi via our final study region of Bakuriani (Area 5). I managed to see Birch in many wild habitats throughout a large part of Georgia. I was able to study *Betula medwedewii* in both of its known Georgian provenances and collect seed. Given its rarity, this was in itself quite an achievement. I witnessed and could study the great variety in the characteristics of *Betula litwinowii*. Seed was collected which can be propagated here in the UK; allowing us to take the research down to chromosome level. I also saw *Betula raddeana* and have been able to collect seed of that species as well.

I am a little disappointed that I did not find more populations of *Betula raddeana*, but at least we now have more material to study and so improve our knowledge of this species. It is also frustrating that *Betula megrelica* continues to remain a bit of a mystery, though again we now have more knowledge of the shrub birch of the Samegrelo (Mingrelia) region.

Studying the birch of Georgia in so many wild locations, each with its own combination of climatic and geo-botanical conditions, has taught me a great deal about the role of these trees in the mountainous Georgian landscape. I have been able to see which plants they co-inhabit with and the extremes of weather and terrain that they cope with. In particular, it has been extremely useful to observe the very limited conditions in which *Betula medwedewii* can thrive, and how precarious the existence of this rare birch is.

The botanists of Georgia are wonderfully enthusiastic people. They are helpful to foreign visitors and epitomise the friendly nature that is a common feature among Georgians. They are woefully under-funded by the state. Given the exceptional bio-diversity of Georgia, this is a shame. Therefore, if foreign organisations could support their work, it would be a great service to the advancement of botany. I have managed to establish a good working relationship with Manana Khutsishvili of the Tbilisi Botanic Garden, and I have a useful contact at Batumi Botanic Garden, David Kharazishvili. I aim to keep in touch with these two botanists and share the results of my research. I will also support and encourage them to travel to the UK to further their studies. I would like to record that without the help and support of the local botanists I could not have achieved the level of success that I did. I would recommend the hiring of expert local guides to anyone contemplating this type of study trip abroad, and I would urge grant funding bodies to continue to fund this kind of expenditure.

Appendix I – Budget

Costs

Air fare (UK to Tbilisi)	£388
Train fare (Exeter-london)	£80
Train fare (London to heathrow)	£34
Tbilisi botanic garden Guide/interpreter	£528
Tbilisi botanic garden Driver	£403
Samegrelo Driver/guide	£248
Batumi botanic garden Guide	£32
Petrol	£452
Accommodation (me plus guides)	£1327
Food (me plus guides)	£525
Maps	£32
Phyto-sanitary certificate	£16
Hospital care and medicines	£30
Phone calls in Georgia	£31
Bank exchange charges	£29

Total expenses: £4155

Financial support received

RHS Blaxall Valentine fund	£1500
Stanley Smith (UK) Horticultural Trust	£1000
Percy Sladen Memorial Fund	£600
Plant Heritage (Devon Group)	£600
RFS Randle Travel Fund	£400

Total funding given £4100

Expenses (from above)	£4155
Less my personal funding of	£500

Total funding spent £3655

So there is £445 of funding that has not yet been spent. However, one of the most important aspects of my research into the Georgian birch will be the 'chromosome counting' of seedlings raised. I am in contact with Richard Buggs of Queen Mary University, London to arrange this and I intend to put the remainder of the funds towards the cost of this research.

Appendix II - Practicalities of the expedition

Georgia is quite a civilised country with most of the amenities that a westerner would be familiar with. Water is generally drinkable, although I do think that my illness was possibly caused by drinking contaminated water in Tbilisi. Towns always had a hotel or at least a homestay (B&B). In rural areas the standard of living is lower and many Georgians must be quite poor (though rich in other ways, such as sense of community). My overwhelming impression is of the open friendliness of Georgians.

For the entire trip I employed Manana (the head of Tbilisi herbarium) and Temuri (the driver). Manana undertook the groundwork, organising the itinerary and arranging the employment of other guides and drivers. Once I had an understanding of where we needed to go to study the trees, I altered the itinerary to suit my requirements in the field. But Manana was essential as interpreter, botanical guide and organiser throughout. Temuri was a calm and professional driver; good company despite neither of us speaking the others language. He also helped with the field studies.

For our study in the Samegrelo district (Area 1), I employed a forester called Bejan to drive us up the forestry tracks in his 6 wheel truck and to guide us to where he thought the trees were.

For our study in the Adjara district (Area 4), I employed a botanist from Batumi botanic garden called David Kharazishvili. He guided us to the trees in that region. He also arranged for me to see a doctor in Batumi.

I also had to pay for the food and lodging of Manana and Temuri during our trips away from Tbilisi.

Because of having to employ so many people, the costs of the expedition were quite high. And as Georgia is a 1st world country, the hotels, fuel and other costs were quite expensive. But the costs were outweighed by the freedom this gave us to move quickly around the countryside. Even in a country as small as Georgia, finding the trees would have been like looking for a needle in a haystack. Having expert guides and a vehicle meant we could move straight to the likely areas and follow up any leads as we went.

Illness

I suffered an attack of acute diorrhea about 5 days into the expedition. This then lasted for 7 days. It could mostly be kept at bay by taking immodium, but you are not supposed to take this for more than a day or so. Every time I stopped taking immodium, the diarrhea returned. This made it difficult to know what to eat, especially in an environment where I was not in control of what food was available. I am normally good at shaking off illnesses, so I delayed seeing a doctor. With hindsight this was probably a bad decision. Meanwhile I still had to travel to keep to the timetable. And I still had to carry on with the study, though fortunately studying trees does give one ample opportunity to dive behind them when the need arises. Finally in Batumi, having talked it over with Rachel, I decided to see a doctor. Manana and David kindly arranged for me to visit the hospital and the doctors took a blood test before giving me a transfusion of two 500ml bags of saline and electrolytes. I was then given a shopping list of medicines, which I had to take for the next 6 days. This did the trick and the condition cleared up.

Internal travel

Whilst Georgia is a relatively small country, travel was sometimes slow and difficult because of the state of many of the back roads. Though the main roads are good, once you travel into the mountains, the roads can become mere stone tracks. This can slow you down to a crawl and be very uncomfortable. The trip from Tbilisi to Samegrelo took about 6 hours. The road between Tbilisi and Kazbegi is mostly fast and takes about 4 hours. From Tbilisi to Batumi took all day. The Road from Batumi to Bakuriani took about 6 hours. So you can spend the whole day travelling from one area to another. This reduced my study time and also made it very tiring.

All the travelling meant that I spent very little time in one district and really didn't settle anywhere at all. With hindsight I think the itinerary was too optimistic. If I had focussed on just two areas (instead of five) I could have covered them in more detail and at the same time had a more relaxing expedition. However, I wouldn't have seen so many trees – so it's a trade-off.

Studying the trees

Whilst Herbarium specimens are undoubtedly useful, I find them to be an incomplete way of displaying the characteristics of a plant. Therefore I did not take any herbarium specimens but instead relied on obtaining good digital photographic images at a high resolution that would allow magnification. Where possible I photograph the whole tree, the stem at ground level, stems higher up, then the young twigs, leaves and catkins. I always try to take photos of both the upper and lower surfaces of the lamina. I generally put the twigs etc on a white sheet to photograph them. Later, I photograph the seeds and scales of the fruiting catkin, again on a white sheet and using a tripod.

My reasons for using digital images are that they are in colour, you can magnify areas of the image you want to study more closely, you can have photos from many different angles and they can be easily shared and stored. Whereas herbarium specimens change colour over time; features such as wax, resin and hair become less distinct; venation becomes flattened and you are only able to see a small portion of the plant. It is important to accurately record the photo numbers against the paper records for each plant studied. I generally matched this information every evening back at the accommodation, whilst it was still fresh in my memory.

To obtain seed and twigs from the trees, I borrowed a long handled pruner from the Tbilisi Botanic Garden. This proved to be very useful and easy to carry around. Where there were low branches I often climbed the trees to obtain samples. I did carry a climbing rope, harness and throw-line, but the trees were never tall enough to need this equipment, given the frequency of low branches. I used clear sealable plastic bags to store seed. These have the advantage of letting you see and destroy any pests that may be lurking with the seed. I bought good maps in Georgia and plotted the locations of trees on the maps. Back in the UK I used the maps to find the locations on Google Earth. I was then able to obtain accurate map references and altitudes. Binoculars are an essential tool for plant hunting. I saved hours of wasted wandering by being able to scan the slopes around. From a distance trees that looked like birch so often turned out to be hazel, white-beam, poplar or even beech. Having the binoculars enabled me to identify genera without making sometimes difficult and tiring diversions. For documenting any characteristics, I used an A5 folder containing waterproof paper that I had pre-printed with blank forms. This makes record keeping much simpler and acts as a reminder so that nothing gets left out. The waterproof paper is strong and can be written on even when it is pouring with rain, without smudging. Essential.

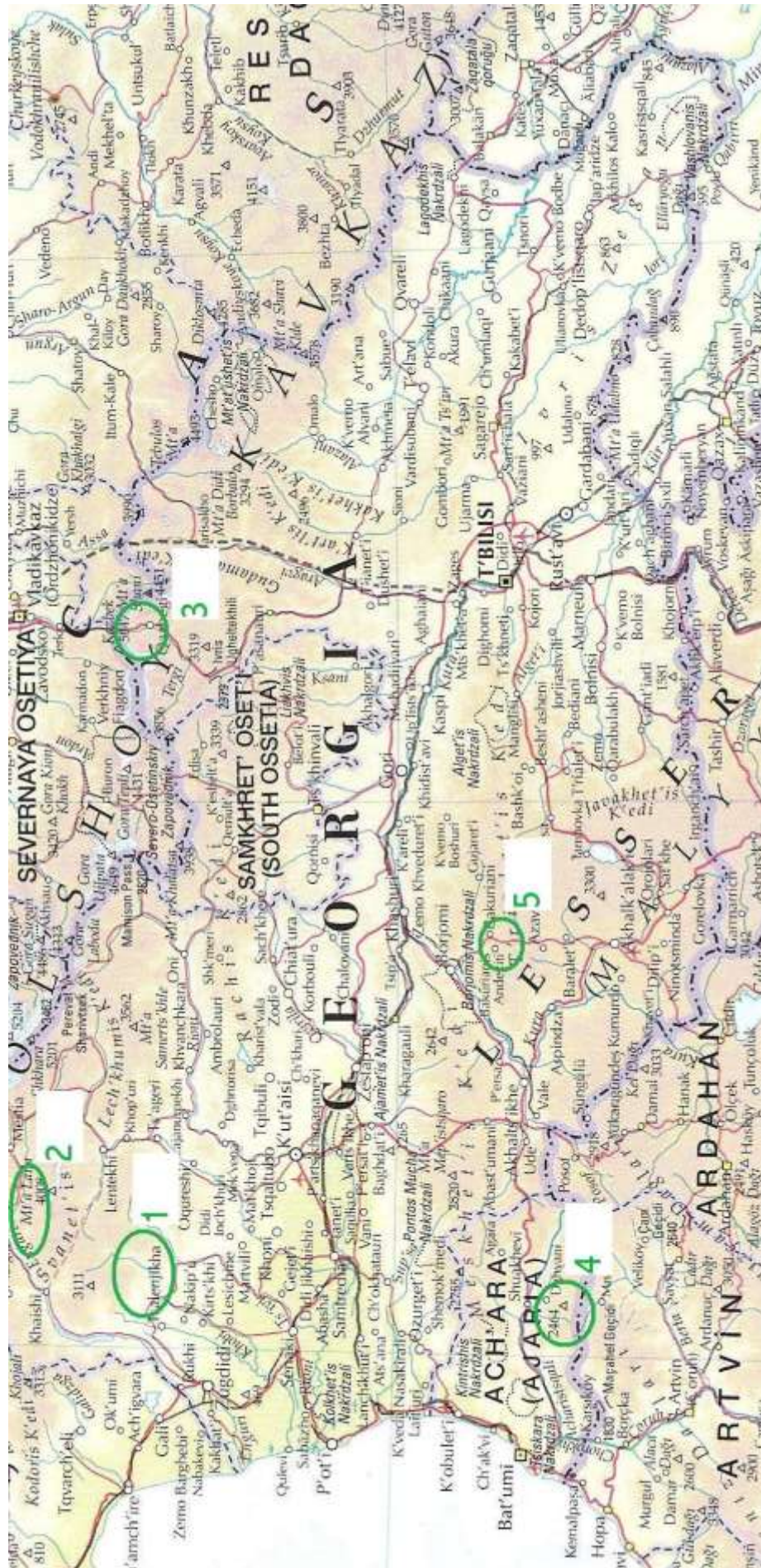
Permissions

With Manana's help I obtained the necessary phyto-sanitary certificate from the Georgian government in Tbilisi. I also obtained permission to travel into the border area between Georgia and Turkey. Without a contact like Manana, it would have been extremely difficult to obtain these permissions.

Appendix III – Phyto-sanitary Certificate

 საქართველო GEORGIA	
1. ექსპორტიორის დასახელება და მისამართი Name and address of exporter BARTLETT PAUL RICHARD Hotel Citadel Naricala, Tbilisi, GEORGIA	2. ფიტოსანიტარიული სერტიფიკატი PHYTOSANITARY CERTIFICATE N 108 110
3. ტვირთის მიმღების დასახელება და მისამართი Name and address of consignee BARTLETT PAUL RICHARD 36 Mill Str., Chaford Devon TQ 13 8AR UK	4. საქართველოს მცენარეთა დაცვის ორგანიზაცია Plant Protection Organization of Georgia მცენარეთა დაცვის ორგანიზაციის to Plant Protection Organization(s) of UK
6. დეკლარირებული სატრანსპორტო საშუალებები Declared means of conveyance by airplane	5. წარმოშობის ადგილი Place of origin GEORGIA გამცემი ორგანო Issued by LEPL NATIONAL FOOD AGENCY
7. დეკლარირებული შეტანის პუნქტი Declared point of entry UK	
8. მარკირება; შეფუთვის რაოდენობა და აღწერილობა; პროდუქციის დასახელება; მცენარეების ზოგადი დასახელება Distinguishing marks; number and description of packages; name of product(s); botanical name of plants One place Seeds of trees and herbs (Betula sp., rosa sp., Alnus sp., Anemone sp., Lilium sp.)	9. რაოდენობა Declared quantity 100 gr.
10. აღნიშნულით დასტურდება, რომ ამ სერტიფიკატში აღწერილ მცენარეებს, მცენარეულ პროდუქციას ან სხვა რეგულირებად ობიექტებს - ჩატარდა ინსპექტირება ან/და ანალიზი აღიარებული პროცედურების შესაბამისად და - თავისუფალია ხელშეკრული იმპორტიორი მხარის მიერ განსაზღვრული საკარანტინო მავნე ორგანიზმებისაგან და პასუხისმგებელი იმპორტიორი მხარის ფიტოსანიტარიულ მოთხოვნებს, მათ შორის, რეგულირებადი არასაკარანტინო მავნე ორგანიზმების მიმართ. This is to certify that the plants, plant products or other regulated articles described herein - have been inspected and/or tested according to appropriate official procedures and - are considered to be free from the quarantine pests specified by the importing contracting party, and to conform with the current phytosanitary requirements of the importing contracting party, including those for regulated non-quarantine pests.	
11. დამატებითი დეკლარაცია Additional declaration	
12. დამუშავების მეთოდი Treatment	13. ქიმიკატი (მოქმედი ნივთიერება) Chemical (active ingredient)
14. ექსპოზიცია და ტემპერატურა Duration and temperature	15. კონცენტრაცია Concentration
16. თარიღი Date	17. დამატებითი ინფორმაცია Additional information
18. გაცემის ადგილი Place of issue TBILISI თარიღი (დღე, თვე, წელი) Date (day, month, year) 14 SEPTEMBER 2012 ორგანიზაციის ზეგედი Stamp of organization უფლებამოსილი პირის გვარი Name of authorized person PARTSVANIA ხელმოწერა Signature	
Non financial liability with respect to this certificate shall attach to the Plant Protection Organization of Georgia or to any of its officers or representatives.	

Appendix IV - Maps



Distribution map for *Alnus barbata*.

Within this area *A. barbata* are likely between 300-800m. They could be found lower in wet valleys, but will not be found in very arid areas.



Distribution map for *Alnus incana*.

Within this area *A. incana* are likely between 800-1500m. They will not be found in very arid areas.



Distribution map for *Betula litwinowii*.

Within this area *B. litwinowii* are likely between 1900-2100m (1200-2100m in the north).



Distribution map for *Betula raddeana*.

Within this area *B. raddeana* are likely between 1500-2100m.



Distribution map for *Betula medwedewii*.

Within this area *B. medwedewii* are likely between 1900-2200m.



Appendix V – Birch photos



Figure 1: Betula in Svaneti



Figure 2: Paul Bartlett with Betula medwedewii, Mt Migaria, Samegrelo





Figure 3: *Betula litwinowii* near Kazbegi



Figure 4: *Betula medwedewii* on Mt Tbeti, Adjara



Figure 5: *Betula litwinowii* above Bakuriani (left) and in Samegrelo (right)



Figure 6: *Betula litwinowii* on steep terrain in Samegrelo



Figure 7: Crook-stem birch forest (*Betula litwinowii*) above Kazbegi



Figure 8: *Betula raddeana* near Kazbegi



Figure 9: *Betula raddeana* woodland on scree near Kazbegi

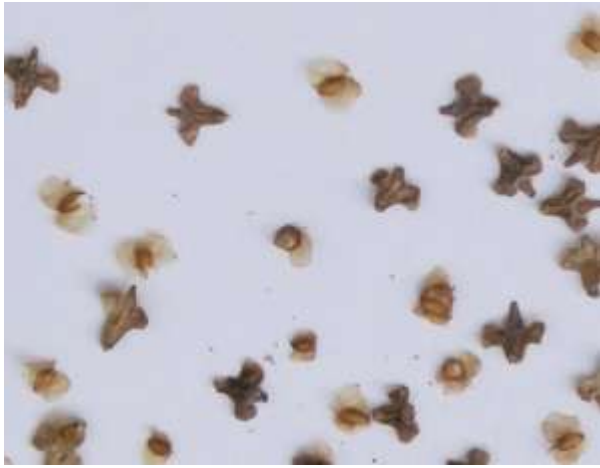


Figure 10: *Betula litwinowii* seeds and scales



Figure 11: *Betula raddeana* seeds and scales



Figure 12: The variation in *Betula litwinowii* leaf characteristics

