Collaborative action to save wild populations of *Betula megrelica* and its habitat - an endangered, alpine tree in the western Caucasus

2015-16 PROJECT PROGRESS REPORT (including field work report)

Fig. 1: Fine specimen of Betula megrelica on the north face of Mt Migaria

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INTRODUCTION

The origin of this project was the 2013 study trip carried out by Paul Bartlett of Stone Lane Gardens, UK in collaboration with a botanist from the Institute of Botany, Ilia State University, Tbilisi, Georgia. The results of the 2013 study trip were published in 2014 (*Identifying wild populations of rare Birch in Georgia* by Paul Bartlett & Manana Khutsishvili 2014).

The 2013 studies highlighted the urgent need to protect *Betula megrelica* and its habitat and identify the full extent of the wild populations. The evidence gathered formed an important component of the 2014 *Red List of Betulaceae (*BGCI) which evaluates this species as 'Endangered'.

It was identified that the main threat to *Betula megrelica* comes from commercial human activities and any future conservation measures would have to address this conflict. Growing numbers of domesticated livestock that feed on plants especially on less steeply angled slopes, increasingly expose the species to damage by browsing. There are concerns that clearing of forests in areas at lower elevation and subsequent introduction of livestock may further increase the grazing pressure on *B. megrelica.*

In 2014, following discussions between Paul Bartlett of Stone Lane Gardens (SLG) and Sara Oldfield and Joachim Gratzfeld of Botanic Gardens Conservation International (BGCI), a partnership was established.
A conservation project was set up to protect this endangered species. BGCI has contacts and influence with the Institute of Botany (IoB) and the National Botanic Garden of Georgia (NBGG), both situated in Tbilisi, Georgia. SLG has the knowledge to locate and identify wild populations of the species, and the facilities to propagate and maintain ex-situ collections. Both partners secured funding for the project.

This report documents the progress made so far, mainly centred around the 2015 field studies. The last part of the report discusses the next stage of the project, scheduled to begin in 2017.

ACKNOWLEDGMENTS

Stone Lane Gardens and BGCI acknowledge the vital support given by the project's funders, without whom this enterprise would not be possible. The Franklinia Foundation, the National Geographic Society and the Rufford Foundation have all contributed greatly to the success so far.
In Georgia, Nukri Sikharulidze (Director) and David Kikodze (Deputy Director) of the Institute of Botany have shown great support and commitment to the project. Their hospitality and knowledge have helped us overcome language and cultural differences and their passion for their endemic flora is to be congratulated. Similarly, the friendship and helpfulness of the staff of both IoB and NBGG (and their colleagues in Samegrelo) made light of any hardships along the way. Lastly, thanks to Manana Khutsishvili, without whose help and friendship Paul would never have visited the lovely mountains of Georgia.

OUTPUTS

This project was set up to achieve the following outputs:

1. Identifying all sites containing wild populations of *Betula megrelica* in the Samegrelo district of Georgia. Mapping their scope and providing important evidence about the populations at that time.
2. Identifying and recording site-specific threats to the populations.
3. Molecular analysis of wild populations, providing data to help in our understanding of the variation and evolution of this relict species.
4. Propagation of wild collected seed and creation of conservation and display collections at botanic gardens in Georgia and the UK.
5. Creation of an action plan for site-specific conservation, backed up by support from international resources.
6. A working partnership with the local communities. Communicating with local community to better understand their needs. Engaging local community (particularly school children) to enhance awareness of the importance of biodiversity conservation.
7. Strengthening international relations between the organisations involved. (Ilia State University Institute of Botany, Tbilisi, Georgia (IoB), National Botanic Garden of Georgia, Tbilisi (NBGG), Botanic Gardens Conservation International (BGCI) and Stone Lane Gardens, Devon, UK (SLG))
8. Creation of a model for good practice for future integrated plant conservation projects.

EXPECTED OUTCOME

Wild populations of Betula megrelica have a better chance of survival through the integration of habitat conservation measures and the creation of *ex situ* conservation collections, enabling future population reinforcement if necessary.

PART 1 SUMMARY OF MILESTONES AND ACTIVITES

2014 Grants awarded by Botanic Gardens Conservation International (BGCI), National Geographic and Rufford Foundation.

May 2015 – Georgian photographer/guide (Roman Tolordava - local to area) commissioned to take photographs of *Betula megrelica* in flower on Mt Migaria. Accomplished successfully – possibly the first photographic record of *B. megrelica* in flower in the wild.

Fig. 2: Betula megrelica in flower

J**une 2015** – Botanists from the Institute of Botany, Ilia State University, Georgia (IoB) make a reconnaissance mission to Samegrelo, to identify access routes to possible study areas identified by Paul Bartlett, Stone Lane Gardens, UK (SLG).

Fig. 3: David Khetsuriani and David Chelidze of IoB investigating access to the study areas - June 2015

September 2015 – Paul Bartlett (SLG) and Joachim Gratzfeld (BGCI) travel to Georgia to take part in 3 weeks of Field Studies and consultations. The Field Studies team also comprised members of the IoB and local guides. Extensive searching of areas around Mt Migaria was carried out, reinforcing the hypothesis that *B. megrelica* requires a very specific habitat for survival. One large new population was discovered in a very remote area on nearby Mt Askhi. New populations were found on the west face of Mt Jvari and the east face of Mt Migaria. Seed and plant material was collected (later Flow

Cytometry revealed all populations have the same genome size and are likely to be dodecaploid). The main school in the nearby large town of Chkorotskhu was visited and broad discussions were held with the head teacher about organising environmental education and links with schools in the UK. Following the Field Studies, consultations took place in Tbilisi with Nukri Sikharulidze (Director) and David Kikodze (Deputy Director) of the IoB to discuss the conservation priorities and decide on the best course of action. Then followed meetings with The Agency of Protected Areas and the Deputy Minister of Education & Science to inform about the project intentions and elicit support from the relevant agencies.

Fig. 4: Our Georgian team at our campsite below Mt Jvari. L-r Arsen Bakhia, Roman Tolordava, Bejan, Manana Khutsishvili and Temur Siukaev

Fig. 5: A meeting at the Ministry for Education & Science. L-r Paul Bartlett, Joachim Gratzfeld, Giorgi Sharvashidze (Deputy Minister), Nukri Sikharulidze and David Kikodze

October 2015 – Drying, cataloguing and storing of seed at SLG. Preparation of seed plots at Bakuriani Botanic Garden, Georgia. Documented Propagation notes prepared for IoB by SLG. Molecular studies of stem material collected during Field Studies carried out by Queen Mary University of London (QML). Preliminary educational outreach visits by botanists of IoB to schools in Samegrelo.

Fig. 6: Seed bed being prepared at Bakuriani Alpine Botanic Garden

Fig. 7: Ilia Akobia (IoB) delivers a presentation at Chkorotskhu school

February 2016 – Draft proposal for next stage of Conservation project sent to IoB for approval and costing.

May/June 2016 – Germination of seed at Stone Lane Gardens. All provenances germinated successfully and potted on. These seedlings will form the basis of the SLG *ex situ* conservation collection, along with seedlings from the 2013 field trip.

September 2016 – Negotiations completed with IoB and Arsen Bakhia concerning the setting up of a pilot Schools programme. Arsen prepares teaching materials for an initial 3 month programme, teaching once a week in Chkorotskhu school, Samegrelo. This began in October 2016.

PART 2 FIELD STUDIES REPORT

INTRODUCTION by Paul Bartlett (SLG)

The Field Studies were carried out between the 2nd -15th September 2015.

I had already identified areas I wished to study. Hours of study of Google Earth and detailed topographical maps, based on our existing knowledge of *B. megrelica*, had revealed the most likely locations of populations. The reconnaissance in June 2015 by IoB had established potential access routes to those areas.

However, things are rarely as straightforward as they seem, and I was expecting to alter our plans as the studies progressed.

DETAILED DESCRIPTION OF FIELD STUDIES

The numbers of the Field Study areas in Fig. 9 correspond with the individual maps for each location.

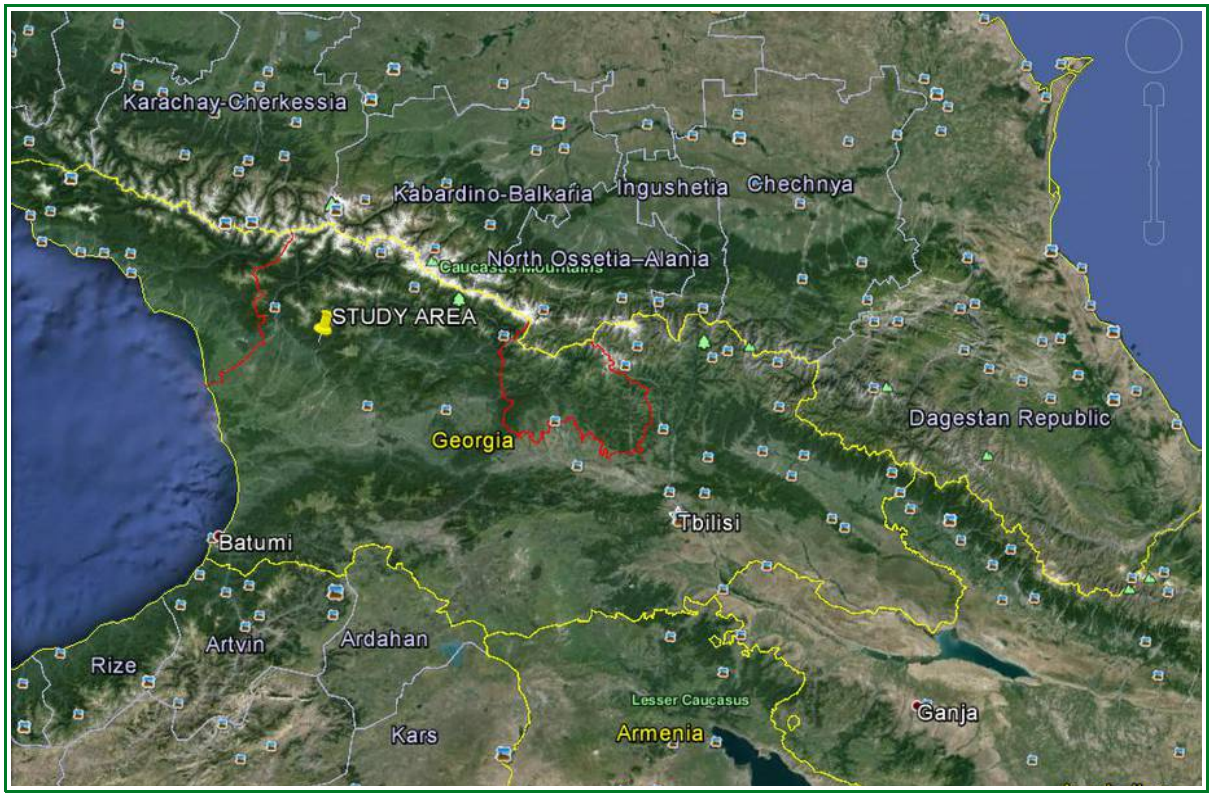


Fig. 8: The country of Georgia with Black Sea on the left and Caspian Sea on the right. Study area of Samegrelo marked on map with yellow pin

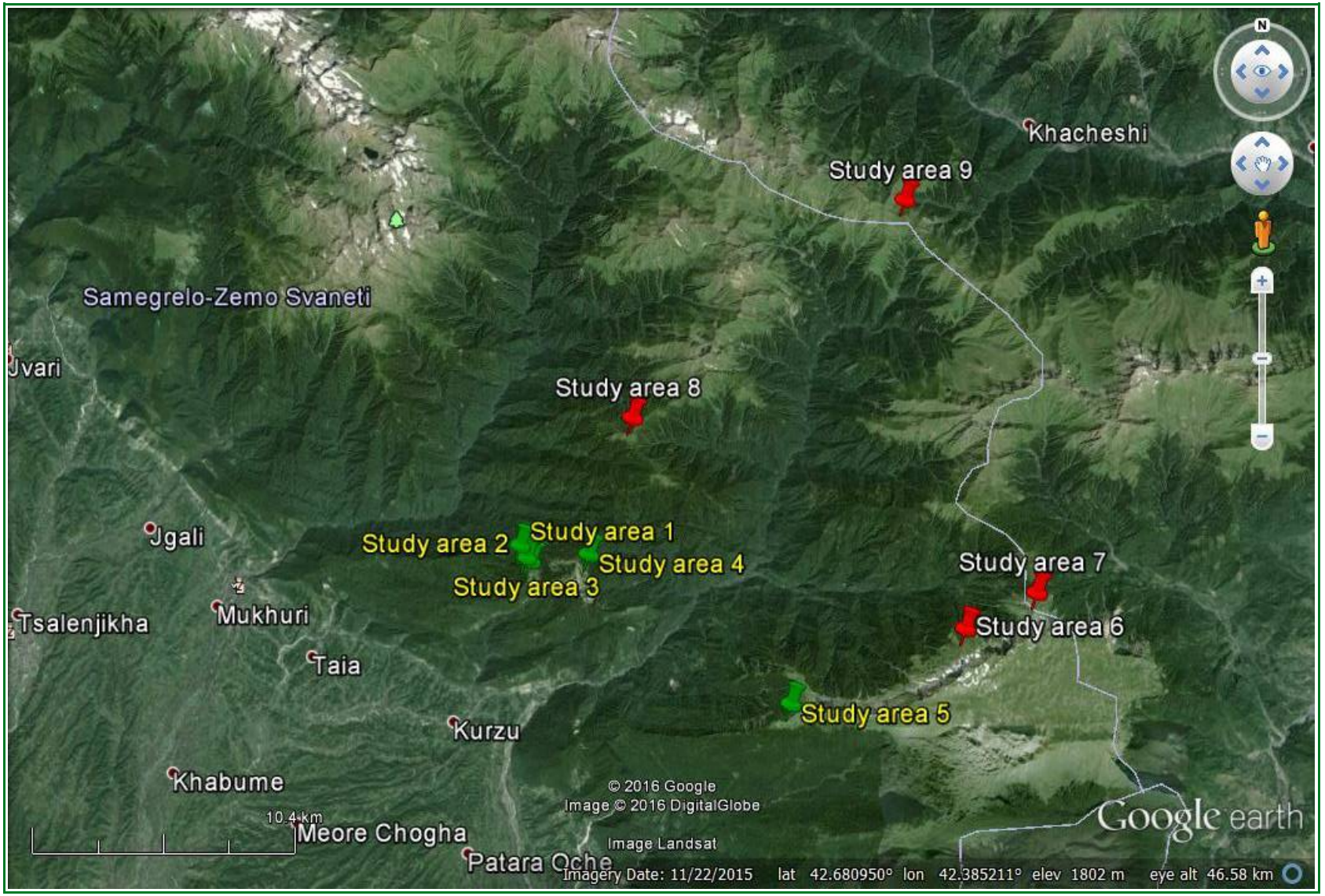
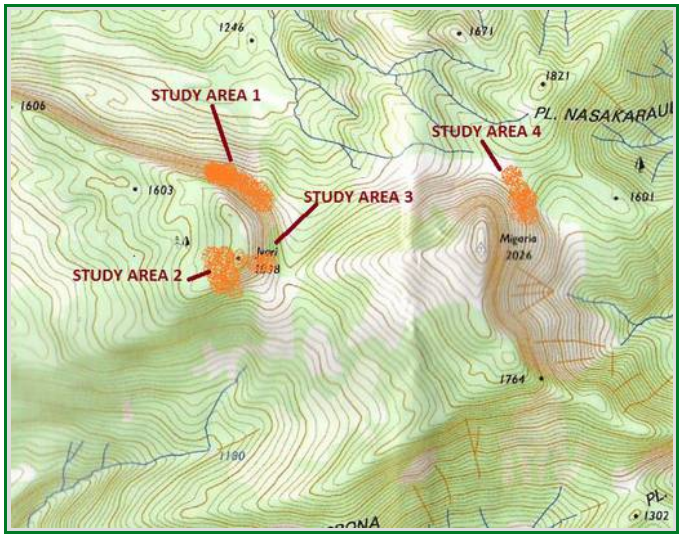


Fig. 9: The Field Study areas in Samegrelo. Green pins show successful searches

Study area 1
North face of Mt Jvari
Date: 04/09/15
Sunny, dry weather. Hot. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

North facing slope comprising loose rocks covered with dense vegetation. The upper half of the slope towards the summit of Mt Jvari has sheer crags interspersed with steep slopes comprising grass and herbaceous plants over loose rock. It is highly likely to contain large populations of *Betula megrelica* (based on fieldwork on the east facing slope), although no field work was carried out there. The lower half of the slope was studied for a distance of approx. 1km westwards. In this area, the middle portion of the slope is exposed with low growing herbaceous plants and grasses over loose rock with some sheer crags. Towards the bottom of the slope, the vegetation is much denser and comprises thickets of large woody shrubs and trees. Difficult access conditions with almost no visible tracks. Much evidence of brown bear presence (*Ursus arctos*).

Fig. 10: North Face of Mt Jvari

Description of human activities

Towards the eastern end of the north facing slope, there is evidence of de-forestation lower down, although most of the north slope appears untouched. There is proof of livestock grazing (faeces, occasional animals encountered, tracks and browsed vegetation) but again this is limited to the very eastern end and is probably facilitated by the de-forestation.

Results of study

Betula megrelica was found in large numbers and various ages throughout the study area, from 1300-1700m. At the eastern end, the plants are younger and heavily grazed, producing almost no flowers and seed. We surmise that following de-forestation, seed from higher elevations was carried to this area and many plants germinated in the more favourable conditions. However, grazing has prevented these plants from fully developing to produce flowers and fruits.

Fig. 11: Grazing damage to a shoot of B. megrelica

As we moved higher into the steeper ground, more mature plants were found and these are fully developed – producing fruits that have proved to be viable (results of germination trials of 2013 collections). Similarly we found mature plants lower down the slope at the western end of our study area, where there is no evidence of grazing. Seed was collected from these trees.

Where *Betula megrelica* was found growing amongst taller shrubs and trees, such as *Fagus orientalis, Acer orientalis, Picea orientalis, Salix* sp., *Laurocerasus officinalis* and *Rhamnus imeretina*, it's characteristics show much variation, presumably due to the shade and shelter provided by the other genera. Leaves are often more regularly toothed, with little evidence of longer vein-end teeth. Their upper surface (adaxial) is usually matt, rather than the more glossy appearance in higher, more open sites. Leaves can also be rounder, almost as wide as they are long, and their base can be more cordate. Shoots can be almost glabrous, with very little hair. And there appears to be less wintergreen (methyl salicylate) in the cambium.

Fig. 12: Leaves of mature tree in shade

Difficulties encountered

Although the mountain-side is steep, it is usually possible to navigate around obstacles such as crags or steep gullies, but the overgrown nature of the terrain, lacking paths, makes field study very difficult and slow.

Fig. 13: Arsen Bakhia with mature, shaded B. megrelica

Comments

It is likely that *Betula megrelica* will be found extending further west than the area we studied, as the terrain looks entirely suitable. It would be desirable to investigate the full range of *Betula megrelica* in this area. My advice would be to approach the west end of the north face by traversing the north face from the easy access at the eastern end. By traversing the slope above the tree line it should be possible to work your way along, about halfway up the face. We achieved this for a short way, during our study of area 1. Some climbing and descending would be needed to thread your way through the crags, but progress, while slow, would still be better than trying to force a path through the dense shrubs at the base and top of the face.

There is much bear activity in the area, and appropriate precautions need to be taken.

COLLECTIONS MADE

PBG372 – *Betula megrelica* – 42.638945 N 42.322089 E 1614m

PBG392 – *Betula megrelica* – 42.642414 N 42.321569 E 1386m

PBG394 – *Ostrya carpinifolia* - 42.642414 N 42.321569 E

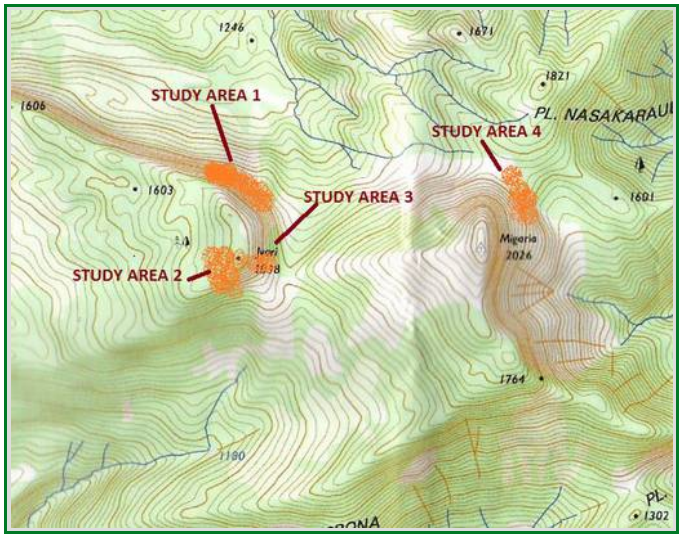
PBG375 – *Sorbus migarica*

PBG335 – Unknown grass

PBG380 – Unknown grass

14: Faeces of brown bear (Ursus arctos)

Study area 2
Mt Jvari south face and west face
Date: 05/09/15
Sunny, dry weather. Hot. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

The west facing slope of Mt Jvari is gently angled and heavily forested all the way to the summit. Large *Picea orientalis, Abies nordmanniana* and *Fagus orientalis* with an under-storey of *Taxus baccata*, *Rhododendron ponticum*, *Laurocerasus officinalis* and *Vaccinium* sp. Deep leaf litter. The south facing slope is steeper, with exposed sheer crags amongst the forest.

Fig. 15: Mt Jvari with the south face on the left

Description of human activities

The upper half of the south and west faces retain their wild forest. I could see no evidence of logging or grazing apart from very low down the south face just below the shepherds hut. However, there is evidence of recent incursions into the lower part of the west face where it flattens. A recent track leads off from the Kurzu track at this point.

There is a shepherds hut at the foot of the east face where it meets the south face. A forestry track comes up from Kurzu to the shepherds hut and continues over the col between Mt Jvari and Mt Migaria before dropping down to the north.

Fig. 16: Shepherds hut below Mt Jvari; We camped near here on both our 2013 and 2015 field trips

Results of study

We climbed the south face with a view to crossing the narrow western slope to reach the north face; which we would then explore westwards. However, we unexpectedly found *Betula megrelica* on the west face not far below the summit at 1780m. Mature trees were found in a clearing under light shade and sheltered by large *Picea orientalis*, *Abies nordmanniana* and *Fagus orientalis.* The population extended some distance around the clearing and younger specimens were found under more dense shade further up the west face sporadically all the way to the summit (approx. 1838m).

There was much variation in the physical characteristics, presumably due to the shade and shelter provided by the other genera. Leaves are often more regularly toothed, although some had longer vein-end teeth. Their upper surface (adaxial) is usually matt, rather than the more glossy appearance in higher, more open sites. Leaves can also be rounder, almost as wide as they are long, and their base can be more cordate. Shoots can be almost glabrous, with very little hair. And there appears to be almost no wintergreen (methyl salicylate) in the cambium.

Fig. 17: Betula megrelica on west face of Mt Jvari in partial shade

This was the first time we had found *Betula megrelica* on a west facing slope, and in the shade of other trees. I conclude that a clearing formed after the collapse of larger trees. This clearing became populated by *Betula megrelica* and at that altitude (1780m) the species has managed to out-compete the other genera. The taller trees around the clearing provide enough shade to keep the under-storey environment humid and moist. It is surprising that young trees were growing healthily under more dense shade away from the clearing. I can only surmise that a combination of altitude and a very localised micro-climate must be providing conditions that *Betula* will tolerate more than other plants.

Fig. 18: Leaves of trees in partial shade

Due to the very dense woody vegetation over the entire west face, it was impractical to try to cross to the north face. So we switched our study area to the summit and then descended the east face. The tall forest extends all the way to the summit, where it thins slightly. At this point it is mostly conifers.

Difficulties encountered

As mentioned, the very dense under-storey of multi-stemmed shrubs over the south and west faces made progress very slow, particularly as there are no paths. So we were only able to cover a fraction of the planned study area. As with all the limestone outcrops we studied, there were many sink-holes (craters in the ground that indicate a hollow in the underlying rock that has already partially collapsed). These can potentially collapse, so we avoided them.

Fig. 19: Paul Bartlett struggling to make progress through dense undergrowth

Comments

More study of the upper west face would be useful to fully determine the size and number of populations of *Betula megrelica* in this area. The upper west face might best be approached by climbing the east face above the shepherds hut to the summit. Then you can enter the forest and work your way down the west face.

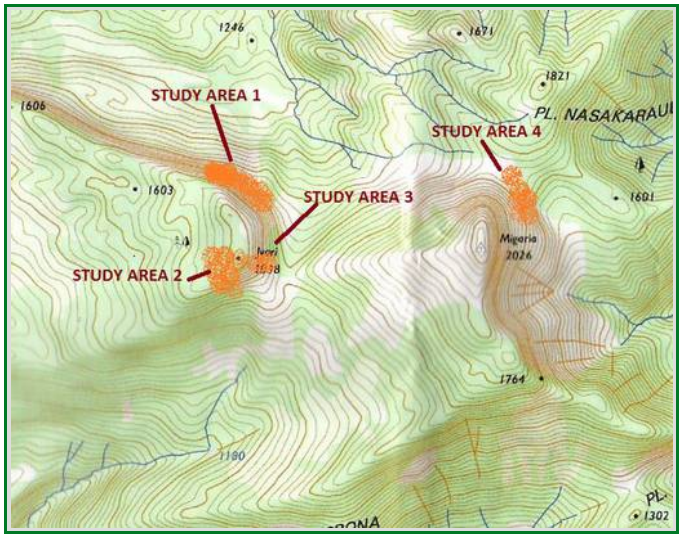
COLLECTIONS MADE

PBG374- *Betula megrelica* - 42.635105N 42.317836 E 1780m

PBG373 - *Betula megrelica* - 42.635105N 42.317836 E 1780m

PBG371- *Betula megrelica* - 42.635105N 42.317836 E 1780m

Study area 3
Mt Jvari summit and east face
Date: 05/09/15
Sunny, dry weather. Hot. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

The summit of Mt Jvari is an undulating ridge running from south to north for about 500m. It is forested, mainly with conifers (*Picea orientalis and Abies nordmanniana*) but with quite dense under-storey of shrubs (mainly *Rhododendron ponticum, Laurocerasus officinalis, Taxus baccata, and Vaccinium* sp.). The west face slopes away gently and is densely forested (see notes on Study area 2), while the east face is steep but grass-covered with few crags.

Fig. 20: Summit & east face of Mt Jvari

Description of human activities

The east face has little forest and is mostly an exposed, grass-covered slope. Some deforestation has taken place in the lower part of the east face and this area is now grazed. Bizarrely, on the summit we found the stumps of a few large *Picea orientalis* that had been felled, though it was difficult to see why anyone would choose to climb the steep hillside on foot with machinery when there are plenty of large trees lower down in more accessible locations.

Results of study

This area was studied on the same day as Study area 2. Having made our way up the west face (where we found mature plants of *Betula megrelica* – see Study area 2 above), we encountered younger specimens at the summit (1815m), in good condition and with plenty of fruit. We then descended the east face, where the species was found dotted sporadically about the steep, grassy slope (1500-1800m). All specimens found were small, under-developed and without fruit. Some grazing damage was visible lower down the slope, but not higher up.

Fig. 21: Betula megrelica on Mt Jvari summit

Difficulties encountered

Most of the difficulties experienced on this day were encountered in Study area 2. The east face was steep but relatively easy to descend thanks to a lack of large crags. The long grass hid loose rocks that made progress a little difficult. A stick made a useful third leg for stability.

Comments

We remain puzzled as to why the *Betula megrelica* found on the east face are so small and yet appear to be un-grazed. The following explanations are possible:

1. Conditions on the steep slope are resulting in poor growth. Plants establish but fail to flourish, though they look healthy enough.

2. They are all quite young plants, establishing on a recently cleared slope. Though there was no evidence of felling, such as old stumps or brash.

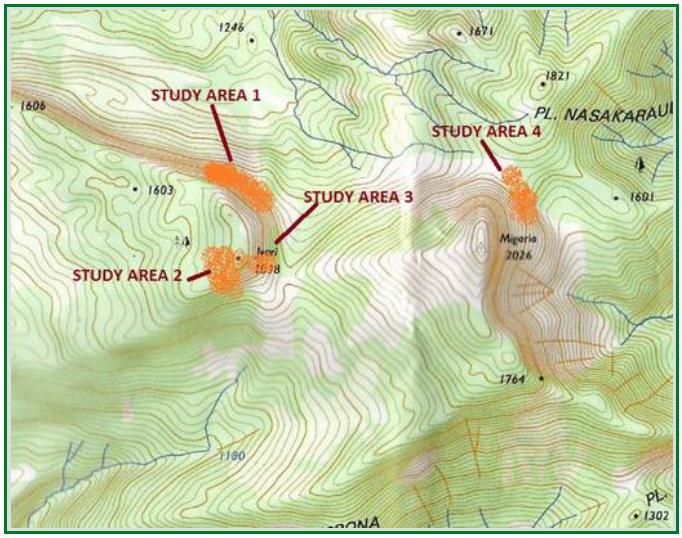
3. They get grazed to the ground every few years and what we could see was all re-growth.

4. Ground disturbance, such as avalanches or landslides, regularly rip out any mature plants, leaving just the younger plants behind.

COLLECTIONS MADE

PBG365 – *Betula megrelica* – 42.634680 N 42.320060 E 1815m

Study area 4
Mt Migaria east face
Date: 06/09/15
Sunny, dry weather. Hot. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

The east face of Mt Migaria is very steep, vertical in many places, made up of a series of large, sheer crags. It is the tallest face on Mt Migaria and is sheer right to the summit. Access to the face is by a forestry track below the north face. This reaches a col below the shoulder where the north and east faces meet. The east face can be accessed by descending the east side of the col for a short way. There are then several gullies and terraces that can be ascended with care. It should be noted that this is quite a serious mountain face and it is unlikely a walking route up the entire face could be found. However, it is certainly possible to access parts of the lower east face, which we did.

Fig. 22: East face of Mt Migaria

Description of human activities

There is a shepherds hut on the track below the north face, and a forestry track does go over the col and down the east side of the mountain. The track below the north face also links up with the main track going over the col between Mt Migaria and Mt Jvari.

The north face flattens to an alpine meadow that is regularly grazed. This is a narrow strip of ground that must have been clear-felled many years ago. This abuts the forest. The track below the north face is in regular use and I witnessed a great deal of timber extraction there. The more gentle slope below the east face shows some signs of grazing, though it is certainly not over-grazed.

Results of study

My studies of 2013 revealed large *Betula megrelica* populations on the north face. We travelled below these populations to reach the col. Once over the col we encountered sporadic small, young plants of *Betula megrelica* at the foot of the east face (1600-1680m), some with grazing damage. The dominant shrub here was *Corylus avellana,* growing in thickets, interspersed with occasional *Betula megrelica*. By climbing up one of the dry gullies, we managed to reach several larger specimens and collected seed (1626m). The trees here were growing straight out of the rock, with the roots reaching deep into cracks in the limestone. There was far less top-soil or leaf litter than in our other study areas. Indeed, the east face was a much drier environment, which probably accounts for the dominance of *Corylus avellana*. We could clearly see larger *Betula megrelica* further up the east face and a sizeable population appears to exist here. Further study would be useful.

Fig. 23: Betula megrelica on the east face of Mt Migaria

Difficulties encountered

The east face is much more imposing than any other face on the mountain. The steepness makes route-finding critical. On the way back from this excursion we encountered a young brown bear (*Ursus arctos*) that came within 5 metres. Although it ran off as soon as it became aware of our presence, appropriate precautions would be advisable on future trips.

Fig. 24: paw print of brown bear on Mt Migaria

Comments

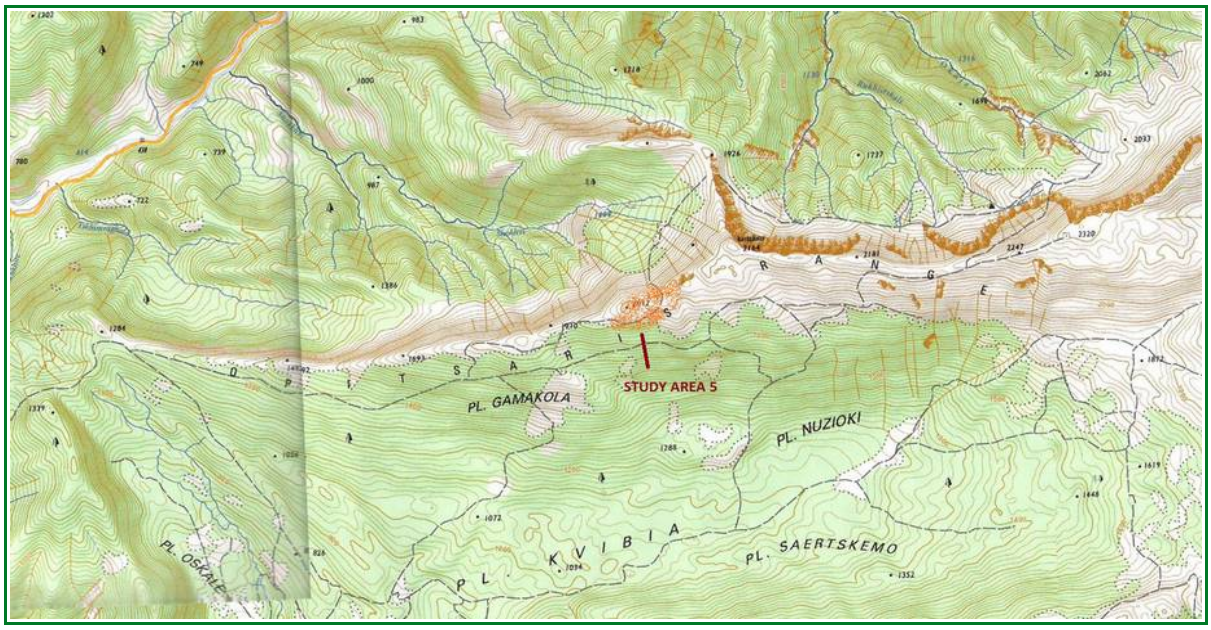
None.

COLLECTIONS MADE

PBG396 – *Betula megrelica* – 42.638228 N 42.347497 E 1626m

PBG344 – *Betula megrelica* – 42.640851 N 42.345291 E 1680m

Study area 5
Mt Askhi – western end of north-facing escarpment
Date: 13/09/15
Mostly dry with occasional short showers earlier. Brightened during afternoon. Strong wind in morning with some thunder. (Thunderstorm during previous night). Early Autumn.
Team: Paul Bartlett & Joachim Gratzfeld



Description of topography

Mt Askhi (sometimes known as the Opitsaris range) is a broad high mountain plateau composed of limestone. The plateau covers an area of approx. 20km x 15km. It is undulating, but the edges are steeper. The north and east faces are very steep – with sheer crags in many places. The western and southern faces are more gentle and are the direction in which most of the rivers drain. The western face has several small gorges. This is also the route taken by the main track onto the plateau. The north face is actually a north-facing escarpment, that runs for 20km, mostly at an elevation of 2000m plus. There are only a few places where a descent of the north facing escarpment is practical.

Fig. 25: The imposing north-facing escarpment of Mt Askhi

Description of human activities

The Askhi plateau has long been used for summer livestock grazing. It is almost entirely denuded of trees or shrubs and there are many shepherds huts and small cattle enclosures. A great deal of cheese-making takes place here and it is clearly an important part of the local economy. There are also several alpine meadows along the base of the north-facing escarpment. These are particularly isolated huts. The western end of the escarpment, where we found *Betula megrelica*, appeared to be isolated from the main grazing area by forest and terrain. There were no obvious signs of grazing here. Tree felling did not appear to be taking place in this area, although we did see much evidence of deforestation lower down the west face.

Fig. 26: The north facing slope containing B. megrelica

Results of study

The western end of the north-facing escarpment is also the lowest point, dropping below 2000m for the first time in it's length. I had calculated that *Betula megrelica* might be found at this point and this proved to be the case. We found a large population clinging to the north face (1600-2061m). The terrain consisted of a steep, exposed grass-covered slope with a few crags and no sizeable trees other than *Betula megrelica*. The wider forest extended to the base of the slope. Although we only studied the upper eastern edge of the population, it was clearly extensive and included trees of differing ages. All appeared to be in good health, with fruiting catkins and immature male catkins evident on most plants and a strong smell of wintergreen. From our high vantage point, *Betula megrelica* appeared to be the dominant species on the nearest slope, although there were also *Salix* sp., *Laurocerasus officinalis* and *Picea orientalis.* The woodland spreads along the slope westwards for 2-4 km, although we do not know how much of this is *Betula megrelica*. All the trees we studied were in an open, exposed position at an elevation of about 2061m. They were quite upright and about 2m high, with very little of the snow-flattening we had seen on more mature trees on the other mountains. There was considerable variation in physical characteristics, with neighbouring trees showing matt or glossy leaves, even or deeply double toothed margins, small or larger fruiting catkins, rounded or pointed buds. Seed was collected from several trees, along with shoot material. Later flow cytometry revealed all the material to have a genome size appropriate for a dodecaploid birch.

Fig. 27: Ripe fruits on a young tree at western end of Mt Ashki escarpment

Fig. 28: Paul Bartlett studying a young specimen (photo: Joachim Gratzfeld)

Difficulties encountered

The population was sited about 8km from the nearest vehicle track. So we had to walk up one valley and then along the escarpment edge for that distance, over the usual knee high vegetation hiding loose rocks. This proved to be tough, exhausting work – although the views were tremendous. We then had to reverse the journey before nightfall. This meant a fairly short time studying the population. The strong winds on the outward journey meant we had to keep away from the cliff edge, which made the terrain worse. On the return, the weather had calmed and we could walk on the ridge-top, facilitating progress. Throughout the entire journey we frequently came across fresh bear faeces. Again, appropriate precautions should be taken on future visits, particularly in such a remote spot.

Comments

This was an exciting find, as we had no prior knowledge of *Betula megrelica* on this escarpment, only an old herbarium note in Tbilisi citing *'Askhi 1850 m. Forest edge'*
This adds enormously to our knowledge of the habitat and dispersal of *Betula megrelica* in this region. It also supports the hypothesis about the niche habitat occupied by *Betula megrelica*.

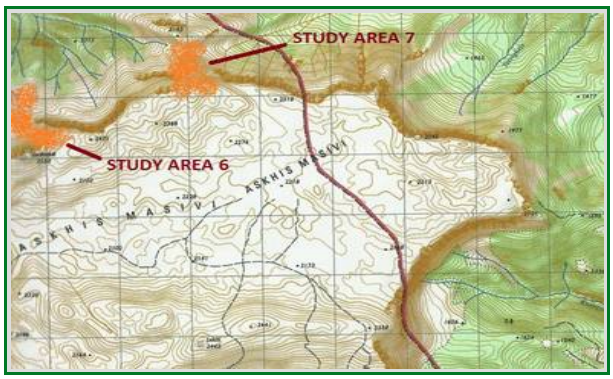
COLLECTIONS MADE

PBG349 – *Betula megrelica* – 42.587642 N 42.444476 E 2061m

PBG345 – *Betula megrelica* – 42.587642 N 42.444476 E 2061m

PBG338 – *Betula megrelica* – 42.587642 N 42.444476 E 2061m

Study area 6
Mt Askhi – central part of north facing escarpment
Date: 12/09/15
Hot, sunny, clear day. Early Autumn.
Team: Paul Bartlett & Joachim Gratzfeld



Description of topography

The central section of this north-facing escarpment is very steep, dropping for about 450m before entering the treeline. The escarpment is limestone and very loose and unstable, but this changes abruptly to a kind of grit-stone (hard, coarse-grained, siliceous sandstone) at the foot of the slope.

Most of this escarpment is too sheer to easily descend, but we were shown a well-used path by one of the shepherds, that descended the slope diagonally to reach the treeline. Only low, herbaceous vegetation and grass grows on the slope, apart from the occasional stunted shrub. Once at the foot of the slope, trees and shrubs appear in the stream gullies before the tree-line itself is reached.

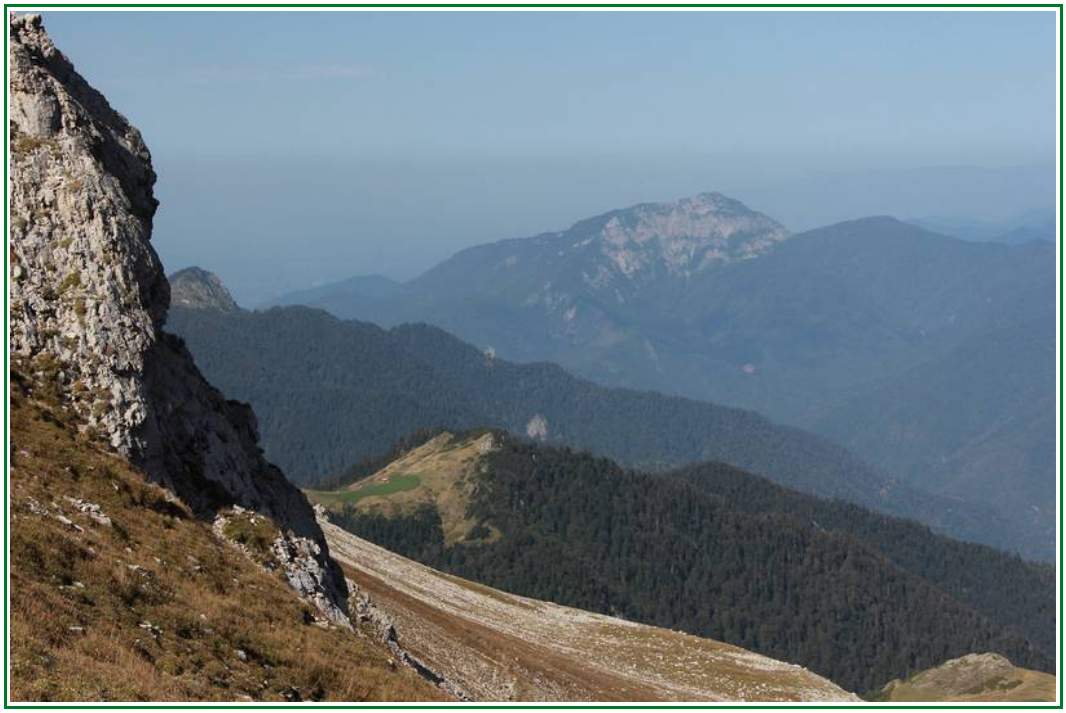


Fig. 29: North facing escarpment of Mt Askhi with Mt Migaria in background

Description of human activities

The path must be used by shepherds to travel between huts. The lower slope is grazed regularly, and there was a shepherds hut about 3km to the west. There was no evidence of logging in the area.

Results of study

The top of the pass was about 2450m. It was unlikely that *Betula megrelica* would be found on the steep upper slope at such high altitudes, but I was hopeful that we would find it at the foot of the slope, at about 2000m. However, as we approached this altitude it became clear that the vegetation was changing and this pointed to an underlying change in the geology. The soil became much sandier, and some outcrops of rock showed that we had entered an area of sandstone. This rock was very like the grit-stone of northern England. We found *Betula pubescens* var. *litwinowii* in great numbers (often heavily grazed), along with *Sorbus graeca. Rhododendron caucasicum* was present in thickets. There was also one unusual tree that appeared to be a variant of *Sorbus graeca*, with more of the appearance of *S. aria*. (PBG314). Photos of this are shown in the Collections appendix to this paper. Despite much searching in the stream gullies (the most likely habitat here) there was no sign of *Betula megrelica*.

The cliff here was a paradise for alpine flowers. Many plants were still in flower. *Gentiana spp., Centaurea spp., Scabiosa spp., Crocus scharojanii* var. *flavus*, and many others - all showing very attractive qualities. A very beautiful and diverse environment.

Fig. 30: Crocus scharojanii var flavus below the north-facing escarpment of Mt Askhi

Difficulties encountered

The steepness of the escarpment meant that there were few options for descent. However, once at the foot of the slope it was possible to move along the slope to access different areas. The weather was good, which helped. In bad visibility it would be difficult to navigate between the sheer crags.

Comments

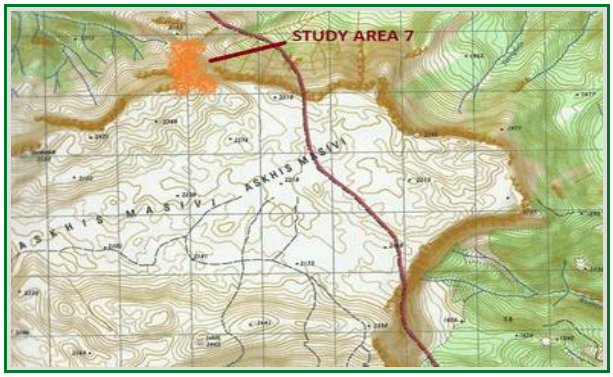
None.

COLLECTIONS MADE

PBG314 – *Sorbus graeca/aria v*ariant – 42.615897 N 42.526523 E 2000m

PBG399 – *Betula pubescens* var. *litwinowii* - 42.615897 N 42.526523 E 2000m

Study area 7
Mt Askhi – col at eastern end of north-facing escarpment
Date: 11/09/15
Hot, sunny, clear day. Cloud along the escarpment. Early Autumn.
Team: Paul Bartlett & Joachim Gratzfeld



Description of topography

The eastern section of this north-facing escarpment is very steep, dropping for about 600m before entering the treeline. The escarpment is limestone and very loose and unstable. At one point, there is a low ridge running northwards from the escarpment, starting about 400m below the escarpment edge. On this ridge there is a col, used as a route from east to west at the base of the escarpment.

Most of this escarpment is too sheer to easily descend, but where the ridge meets the escarpment the slope is less steep. Here we found a path that descended the slope to reach the col on the north ridge. Only low, herbaceous vegetation and grass grows on the slope, apart from the occasional stunted shrub. Once at the foot of the slope, trees and shrubs appear in the stream gullies before the tree-line itself is reached.

Fig. 31: Joachim Gratzfeld at the top of the escarpment on Mt Askhi

Description of human activities

There is clear evidence of grazing between the foot of the escarpment and the forest. We were not in this area long enough to study it thoroughly and the cloud on the col prevented a proper observation of the area.

Results of study

The few hours we spent here were really a reconnaissance, to discover a way down to the foot of the escarpment. We used the north ridge and col to achieve this. It was unlikely we would find *Betula megrelica* on the slope, as the altitude was too high. The col itself lies at about 2000m, so we thought it possible we would find *Betula megrelica* here, if there were any suitable sites. However the area is extensively grazed and we did not find any evidence of the species. It is entirely possible that *Betula megrelica* could be found to the east of the col, at the foot of the escarpment. A detailed study of this area is recommended.

Difficulties encountered

The steepness of the escarpment meant that the north ridge is really the only option for descent. The almost constant cloud drifting along the escarpment prevented us from really studying the area.

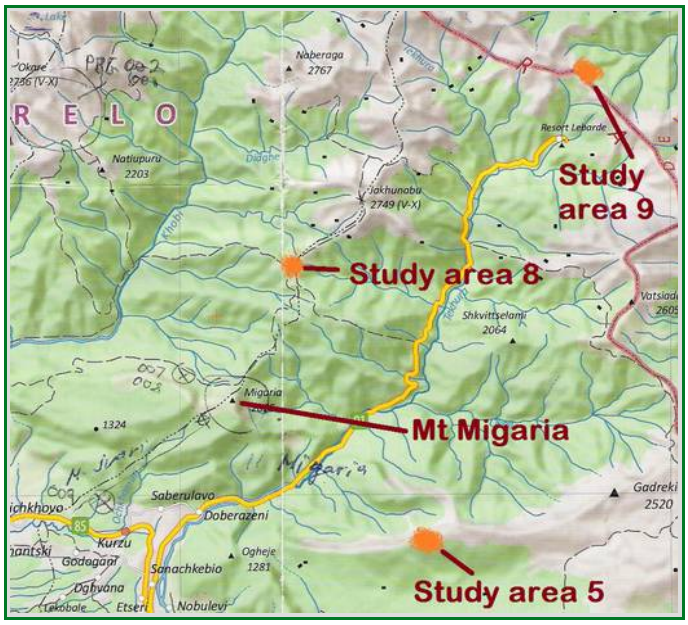
Comments

The foot of the escarpment to the east of the col may contain *Betula megrelica* and I recommend a thorough search of this area.

COLLECTIONS MADE

None.

Study area 8
Mt Natolebi
Date: 08/09/15
Hot, sunny, clear day. Cloud built up in late afternoon. Thunderstorm at end of evening. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

One of the peaks on the ridge running north north east from Mt Migaria. This ridge gets progressively higher as it heads north, finally joining the range of mountains separating Samegrelo from Svaneti. There are steep north and east faces on several peaks along this ridge, at the right altitude for *Betula megrelica*. The sides of Mt Natolebi are heavily wooded, but the last 200m are above the tree-line. Although the shape of the mountains on this ridge suggests a different rock type, I felt it was important to search the close neighbourhood of Mt Migaria, if only to re-enforce our hypothesis about the habitat of *Betula megrelica*.

Description of human activities

There is a considerable amount of felling in the area, with lorries constantly removing large tree trunks. This would appear to be for timber, rather than firewood. Many bee-keepers use clearings to set up large colonies of bees. There is very little grazing on the forested slopes, but we found one shepherd hut on Mt Natolebi, and clear evidence of grazing above the tree-line.

Results of study

The forest is very diverse, with a wide range of under-storey and canopy vegetation. The rock is a kind of limestone, but harder than the kind found on Mt Migaria, and without the sheer crags and limestone pavement. There is no evidence of caves or sink-holes, so clearly this rock does not weather or react to water in the same way as the rock on Mt Migaria. We searched the upper slopes of the north face, but it was clear we were not going to find *Betula megrelica*. Dense vegetation covers the slope to the tree-line, with only *Rhododendron caucasicum* and *R. luteum* above the tree line. *Quercus pontica* was very common as a short, multi-stemmed shrub. *Fagus orientalis w*as also present in large numbers, as was *Sorbus graeca. Betula pubescens* var. *litwinowii* was present in occasional groups.

Fig. 32: Looking south from Mt Natolebi with Mt Migaria on left and Mt Jvari on right

Difficulties encountered

Access to these peaks is difficult, relying on tortuous forestry tracks. The density of vegetation makes movement across the slopes very difficult.

Comments

During early studies of the topography prior to the field studies, I highlighted several mountain slopes near to Mt Migaria that had north or east facing slopes of the right steepness and altitude to sustain *Betula megrelica*. If *Betula megrelica* did not require very specific conditions to survive then we should find it on slopes like these close to Mt Migaria. However, our failure to locate *Betula megrelica* here, and the dense growth of competitor species, add weight to our hypothesis that *Betula megrelica* only survives where the rock type limits the competition.

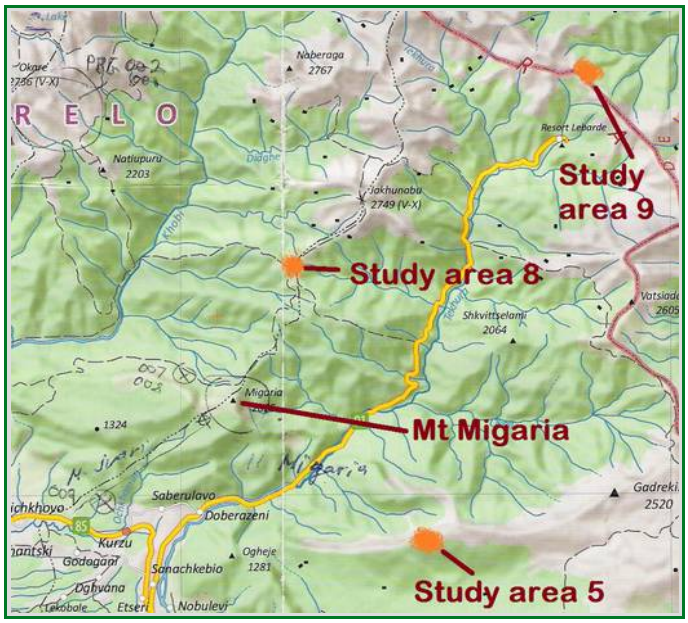
Fig. 34: Hard limestone east facing slope - no B. megrelica

Fig. 33: Soft Limestone east facing slope - B. megrelica present

COLLECTIONS MADE

None.

Study area 9
North facing slope on ridge to the north of Lebarde
Date: 03/09/15
Hot, sunny, clear day. Early Autumn.
Team: Paul Bartlett & Arsen Bakhia



Description of topography

Lebarde is a summer-camp at the head of the valley of the river Tekhuri. It is encircled by mountain ridges separating it from Svaneti. The rock is a kind of limestone, but harder than the kind found on Mt Migaria, and without the sheer crags and limestone pavement. There is no evidence of caves or sink-holes, so clearly this rock does not weather or react to water in the same way as the rock on Mt Migaria. The ridges are above the treeline.

Fig. 35: Arsen Bakhia on the ridge above the search area

Description of human activities

The summer-camp at Lebarde was built up during the soviet era, and would have received many visitors during that time. The buildings would have been created from local timber which would account for the clearings around the summer-camp. It is clear that the forest around the camp has been reduced over time. Grazing takes place in those cleared areas and up onto the higher slopes. We saw one shepherds hut on the upper slopes. The summer-camp has received some renovation recently and again I would expect the timber to have been sourced locally. In this location the only fuel would be fire-wood, so much felling must be taking place for firewood. There was no evidence of grazing on the steep and densely vegetated north-facing slope.

Results of study

The only likely site for *Betula megrelica* is on the steeper, north-facing side of the ridge above Lebarde. The top of the ridge is too high at 2400m, so we needed to drop down the slope on the northern side. Here we encountered dense, waist-high undergrowth of *Rhododendron caucasicum* and *R. luteum*. Some *Betula pubescens* var. *litwinowii* present. We found no evidence of *Betula megrelica*. As with Study area 8, the dense growth of competitor species probably accounts for the lack of any *B. megrelica* populations here.

Difficulties encountered

For once we had good access to the mountain ridge, thanks to a number of good paths. These obviously exist because of Lebarde's status as a local holiday destination. The only difficulty was in moving around the north-facing slope, due to the waist-high undergrowth.

Comments

During early studies of the topography prior to the field studies, I highlighted several mountain slopes near to Mt Migaria that had north or east facing slopes of the right steepness and altitude to sustain *Betula megrelica*. If *Betula megrelica* did not require very specific conditions to survive then we should find it on slopes like these close to Mt Migaria. However, our failure to locate *Betula megrelica* here, and the dense growth of competitor species, add weight to our theory that *Betula megrelica* only survives where the rock type limits the competition.

COLLECTIONS MADE

None.

PART 3 - CONCLUSIONS OF 2015 FIELD WORK

Building on our field work on Mt Migaria and Mt Jvari in 2013, the additional time spent in the field in 2015 has increased our knowledge of *Betula megrelica* in several ways:

1. Evidence that *Betula megrelica* can grow and thrive in partial shade.
2. The suggestion that *Betula megrelica* exhibits different characteristics in partial shade.
3. The discovery of a healthy and large population of *Betula megrelica* on Mt Askhi.
4. Evidence that *Betula megrelica* can grow and thrive on west-facing slopes in the right conditions.
5. Supporting evidence for the hypothesis that *Betula megrelica* will only flourish in areas with a particular soil type that stifles competition.

1. Evidence that *Betula megrelica* can grow and thrive in partial shade.

In Study area 2 we witnessed *Betula megrelica* growing well in a partially shaded area, surrounded by much taller trees. This population was comprised of large mature trees and also younger specimens. All appeared to be healthy, although less fruits were present. We witnessed a very similar outcome in a small part of Study area 1. As a rule, *Betula* (being pioneer species) do not tolerate extensive shade.

2. The suggestion that *Betula megrelica* exhibits different characteristics in partial shade.

The *Betula megrelica* we studied in shady, sheltered conditions had several different characteristics. A noticeable lack of wintergreen (*methyl salicylate*) in the cambium; more regular leaf margins; a thinner, less glossy upper leaf; a rounder leaf shape and hairless shoots. See notes for Study areas 1 & 2.

3. The discovery of a healthy and large population of *Betula megrelica* on Mt Askhi.

In Study area 5 we reached the edge of what appeared to be a large population of *Betula megrelica*. We did not have time to study this area in detail, but it appeared to extend for some distance, both along and down the slope. To our knowledge this is the first properly documented and mapped observation of *Betula megrelica* on Mt Askhi.

4. Evidence that *Betula megrelica* can grow and thrive on west-facing slopes in the right conditions.

In Study area 2 we witnessed *Betula megrelica* growing high on the western slope of Mt Jvari. Normally the western slopes would be very hot and dry, and this species appears to prefer cooler, damper conditions. However, these trees were surrounded by much larger trees, giving more humid, sheltered conditions with a deep, moist leaf litter. The trees were mainly mature and healthy. Our suggestion is that only the unusually sheltered conditions allow *Betula megrelica* to grow on this western slope.

5. Supporting evidence for the hypothesis that *Betula megrelica* will only flourish in areas with a particular soil type that stifles competition.

In my 2013 report 'Identifying wild populations of rare birch in Georgia', I raised the probability that *Betula megrelica* only exists on Mt Migaria and Mt Jvari because it is the dominant species. Elsewhere it cannot compete with more vigorous vegetation. It appears to require a niche habitat in order to survive.

In 2015 we studied more satellite areas around Mt Migaria, in order to test this theory. These field studies (Study areas 8 & 9) backed up the suggestion that it is only on the particular type of limestone found on Mt Migaria, that *Betula megrelica* can out-compete other species. This is also backed up by our findings on Study area 6, and our studies on nearby Mt Tsashkibuli in 2013. It is reasonable to hypothesise that the normally dominant woody plant species in the area struggle to obtain enough nutrients from this particular soil type, whereas *Betula megrelica* has evolved to cope with the lack of nutrients.

It would be very useful to identify the limestone that makes up the Mt Migaria/Mt Jvari/Mt Askhi ranges. It is clearly very different to the predominant rock in this part of Samegrelo, which appears to be a harder form of limestone.

We intend to commission studies of the rock and soil types in this area. We also intend to run germination/propagation trials with seed of *Betula megrelica* to gauge the effect of differing soil pH levels on germination and growth rates.

CONSERVATION AND 'ENDANGERED' STATUS

The 2015 Field Studies confirmed that *Betula megrelica* is limited to a small area of mountains in the Samegrelo district. It also suggests that this limitation is due to the niche limestone habitat required for dominance.

The highlight of the 2015 studies was clearly the discovery of a large and healthy population of *Betula megrelica* on Mt Askhi. This population is quite remote and currently does not appear to be suffering the effects of grazing or logging. This is clearly good news for the survival of the species in the wild.

Despite the discovery of a new population, it would be foolish to disregard the dangers posed by human activities in the area. Uncontrolled logging will continue to destroy the upland forest ecosystem and will open up the landscape to grazers of livestock. Since the livestock (particularly goats) can roam freely, then damage to any plants within range will occur. In the case of slow-growing species such as *B. megrelica*, this damage could prove catastrophic. Until some effective control of human activities is implemented, a programme to monitor wild populations needs to be continued.

The probability that *Betula megrelica* is limited to such small geographical areas, is, we believe, a good reason to continue with the IUCN Red List classification of 'Endangered'.

PART 4 - 2015 COLLECTIONS PHOTO GALLERY

PBG310 – collected for the IoB *ex situ* conservation collection to be propagated at Bakuriani. These seeds either failed to germinate or were stifled by weed growth in the seed beds. Seed was also collected by Manana Khutsishvili for the Herbarium seed bank.

Fig. 36: ***PBG338*** *seed*

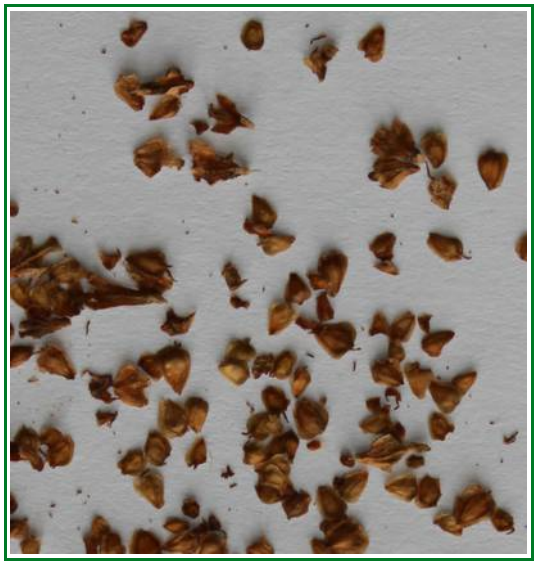


Fig. 37: ***PBG345*** *seed*

*Fig. 38: **PBG349** – Joachim Gratzfeld on the western end of Mt Askhi*

*Fig. 39: **PBG349** - current seasons growth*

*Fig. 41: **PBG349** seeds*

*Fig. 40: **PBG349***

Fig. 42: ***PBG365*** *at summit of Mt Jvari*

Fig. 43: ***PBG365*** *seeds*

Fig. 44: ***PBG371*** *seeds*

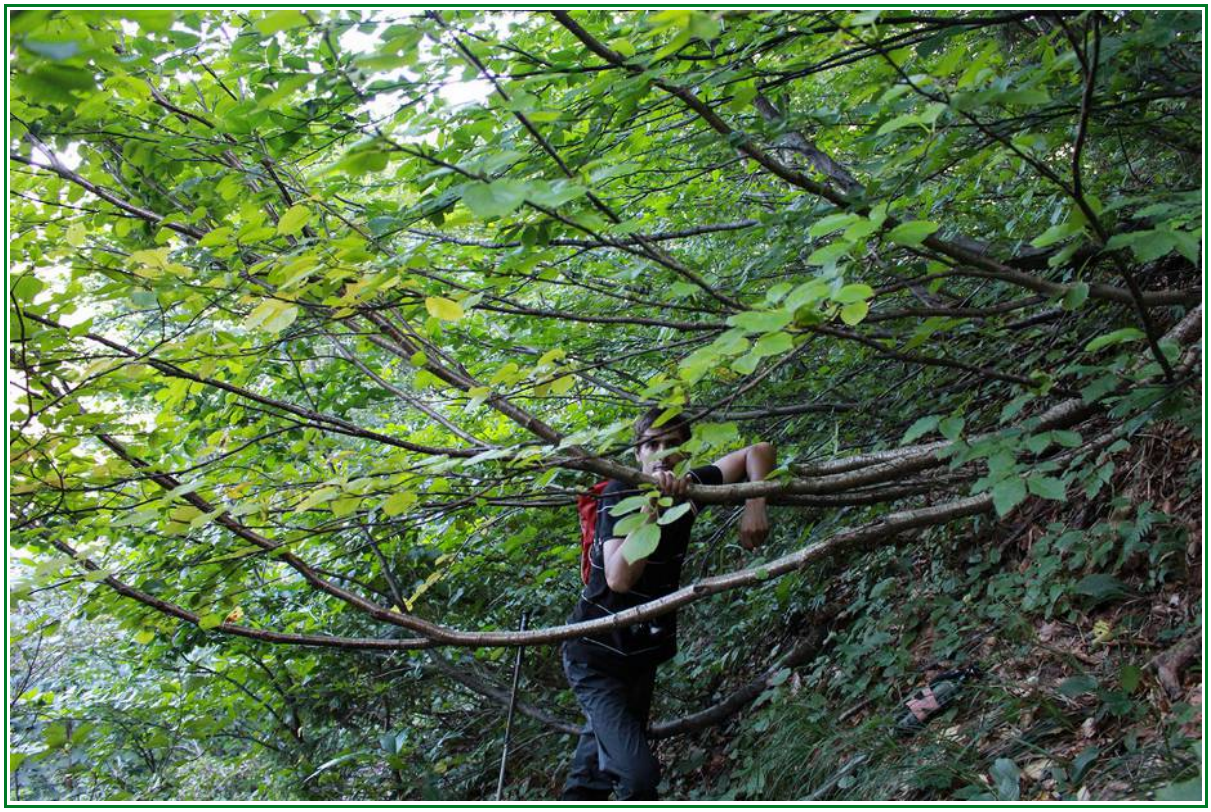


*Fig. 45: **PBG372** in shade low down on north face of Mt Jvari*

*Fig. 46: **PBG372** fruits*

*Fig. 48: **PBG372** seeds*

*Fig. 47: **PBG372** stems*

Fig. 49: ***PBG373*** *– west face of Mt Jvari*

Fig. 50: ***PBG373*** *fruit*

Fig. 51: ***PBG373*** *– rounded, matt leaves typical of trees in shade*

Fig. 52: ***PBG373*** *seeds*

Fig. 53: ***PBG374*** *– west face of Mt Jvari in partial shade*

Fig. 54: ***PBG374*** *– the base of old stems can be plated*

Fig. 55: ***PBG374*** *– shiny, tightly peeling bark only appears on mature trees*

Fig. 56: ***PBG374***

Fig. 57: ***PBG374*** *seeds*

Fig. 58: ***PBG374*** *fruit*

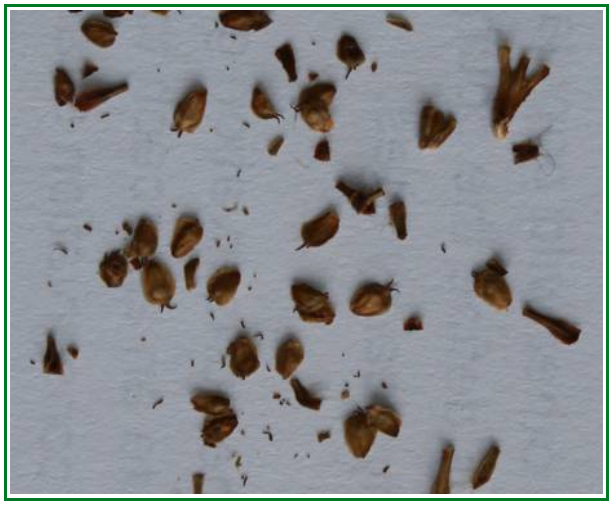


Fig. 59: ***PBG377*** *seeds*

Fig. 60: ***PBG392*** *fruit on left. Note the difference in length and how the scales curve outwards, compared with a typical fruit*

Fig. 61: ***PBG392*** *seed*

*Fig. 62: **PBG396** – Mt Migaria east face*

*Fig. 63: **PBG396** - showing the typical arrangement of long hairs on the mid-rib and petiole*

*Fig. 65: **PBG396** fruit*

*Fig. 64: **PBG396** seed*

*Fig. 66: **PBG314** - Sorbus aria variant on Mt Askhi*

*Fig. 68: **PBG314** - darker leaves than nearby S. graeca with green fruits not colouring*

*Fig. 67: **PBG314** - leaves more lobed than S. graeca, with pale and pubescent underside*

*Fig. 69: **PBG314** - twigs showing long hairs*

PART 5 – 2015 COLLECTION NUMBER LISTING WITH PROVENANCE

Collection no.	Species	Date collected	Location	Coordinates
PBG301	Primula auricolor	12/09/15	Mt Askhi - north face	42.615897 N 42.526523 E 2000m
PBG302	Centaurea fischeri	12/09/15	Mt Askhi - north face	42.611113 N 42.531194 E 2200m
PBG309	Carpinus orientalis	06/09/15	track to Mt Migaria	
PBG310	Betula megrelica	14/09/15	Mt Migaria - north face	42.640528 N 42.329351 E 1470m
PBG311	Berberis vulgaris	19/09/15	Gweleti - near Kazbegi	42.704214 N 44.619043 E 1653m
PBG314	Sorbus graeca variant	12/09/15	Mt Askhi - north face	42.615897 N 42.526523 E 2000m
PBG335	grass - unknown	04/09/15	Mt Jvari - north face	1600m
PBG338	Betula megrelica	13/09/15	Mt Askhi - north face - western end of ridge	42.587642 N 42.444476 E 2061m
PBG341	Carpinus caucasica	03/09/15	Road to Lebarde	800m
PBG344	Betula megrelica	06/09/15	Mt Migaria - east face just below col	42.640851 N 42.345291 E 1680m
PBG345	Betula megrelica	13/09/15	Mt Askhi - north face - western end of ridge	42.587642 N 42.444476 E 2061m
PBG347	Euonymus europaeus	05/09/15	Mt Jvari near summit	42.635105 N 42.317836 E 1837m
PBG349	Betula megrelica	13/09/15	Mt Askhi - north face - western end of ridge	42.587642 N 42.444476 E 2061m
PBG365	Betula megrelica	05/09/15	Mt Jvari - summit	42.634680 N 42.320060 E 1815m
PBG371	Betula megrelica	05/09/15	Mt Jvari - west slope below summit	42.635105 N 42.317836 E 1837m
PBG372	Betula megrelica	04/09/15	Mt Jvari - north face	42.638945 N 42.322089 E 1614m
PBG373	Betula megrelica	05/09/15	Mt Jvari - west slope below summit	42.635105 N 42.317836 E 1837m
PBG374	Betula megrelica	05/09/15	Mt Jvari - west slope below summit	42.635105 N 42.317836 E 1837m
PBG375	Sorbus migarica	04/09/15	Mt Jvari - north face	1600m
PBG377	Betula megrelica	15/09/15	Mt Migaria - west face	
PBG380	grass - unknown	04/09/15	Mt Jvari - north face	1600m
PBG381	Betula raddeana/pubescens hybrid	19/09/15	Gweleti - near Kazbegi	42.704214 N 44.619043 E 1653m
PBG382	Viburnum lantana	06/09/15	Mt Migaria - east face just below col	42.640851 N 42.345291 E 1680m
PBG383	Betula raddeana	19/09/15	slope above Tsminda Sameba, Kazbegi	42.665109 N 44.610134 E 2247m
PBG389	Betula raddeana/pubescens hybrid	19/09/15	slope above Tsminda Sameba, Kazbegi	42.665109 N 44.610134 E 2247m
PBG392	Betula megrelica	04/09/15	Mt Jvari - north face	42.642414 N 42.321569 E 1386m
PBG394	Ostrya carpinifolia	04/09/15	Mt Jvari - north face	42.642414 N 42.321569 E 1386m
PBG396	Betula megrelica	06/09/15	Mt Migaria - east face	42.638228 N 42.347497 E 1626m
PBG398	Sorbus migarica	13/09/15	Mt Askhi ridge	42.590392 N 42.494098 E 2200m
PBG399	Betula pubescens var litwinowii	12/09/15	Mt Askhi - north face	42.615897 N 42.526523 E 2000m

PART 6 - DRAFT PROPOSAL FOR STAGE 2 OF THE CONSERVATION PROJECT

Collaborative action to save wild populations of Betula megrelica and its habitat - an endangered, alpine tree in the western Caucasus

UPDATED ACTION PLAN

Members:
Paul Bartlett – Stone Lane Gardens (SLG)
Joachim Gratzfeld – Botanic Gardens Conservation International (BGCI)
Georgian team: David Kikodze and Nukri Sikharulidze – Institute of Botany, Ilia State University, Georgia (IoB)

INTRODUCTION

Following our successful field study expedition to Samegrelo in September 2015, Paul Bartlett , Joachim Gratzfeld, David Kikodze and Nukri Sikharulidze had several meetings with Officers of the Agency of Protected Areas and the Deputy Minister of Education and Science in Tbilisi, Georgia to inform them about the project intentions and elicit support from the relevant agencies. Our observations in the field confirmed that *Betula megrelica* has a very restricted habitat. Around that habitat there is increasing logging and grazing activity with no control or management. It was clear that the habitat was therefore under threat from human activities. e
It became clear from our talks that:-

1. Creating a protected area or National Park in Samegrelo would be a good first step, but on it's own will not dramatically change how local populations use the resources, as there is some doubt about the effectiveness of policing in existing protected areas.

2. Alternatives to indiscriminate clear felling of the wild forest, such as lowland plantations, may be worth encouraging but are not attractive while it remains easy to remove wild timber by truck.

3. Much of rural Georgia (and Samegrelo in particular) is very poor, with few well paid jobs and a great deal of subsistence farming. Wood is the only affordable fuel available for heating. Logging and grazing are both activities that can supply a steady income, and both are traditional activities of the region.

4. Samegrelo has a very strong regional identity. The Mingrelians appear to be a very independently minded people, distinct from the rest of Georgia. They have their own dialect and customs and show a certain disregard of central Georgian control. This may effect any decisions where we need the cooperation or interaction of local people. Where possible, using Mingrelians to help with our work in the area may benefit our project and give us more influence.

While we will still recommend that the area around the habitats is made into a Protected Area, we think that it is equally important to engage and educate the local populations. In particular the school-children who will potentially be the next generation of loggers and grazers.

We have now developed an 8 point strategy.

1 **Pilot Schools programme**

Our first step in educating the children has been to set up a small-scale programme in Samegrelo to trial our ideas. Initially we have engaged a teacher to run lessons and activities in Chkorotskhu school, one of the main towns in that part of Samegrelo. These lessons teach the students about their local forest areas, the plants and animals in them, the rare species and the dangers they face. We are focusing on *Betula megrelica* but also teach a wider understanding of biodiversity and its benefits and the need to manage resources. We are employing Arsen Bakhia, a young and enthusiastic Biology teacher who is known to the Institute of Botany and helped us with the fieldwork in 2015. His family are from Samegrelo. Initially we have contracted him for the three month period of October to December 2016.

We would like to continue this programme for at least another 6 months, to measure the effect of this initiative

As part of this project we would like to set up links between the Georgian schools and some schools in the UK near to Stone Lane Gardens. In this way we could teach schools in both countries about conservation using a practical example. At the same time the link would provide important cultural and language exchange. We feel that the opportunity of this kind of link will create more enthusiasm for the conservation side of the project as it will allow the teaching staff to fit the project into a wider range of lesson plans.

2 **Social Media groups and forums**

During our meeting with the deputy Minister for Education and Science, Dr Giorgi Sharvashidze, we were informed of a project in Georgia called the National Educational Olympiad. This is a contest between most schools in Georgia and the winners create a forum of young talent. It was suggested this forum may be able to help think of innovative ideas to interest young people in conservation of Georgian endemic species. We met with two students from this forum and they were keen to be involved in the project. However, follow-on discussions between this forum and the IoB have revealed a lack of any real interest in joining our project.

This is disappointing but has highlighted a possible way of communicating with the youth of Samegrelo. It may be possible to use social media communication to reach the youth of Samegrelo in a way that official school channels cannot. But perhaps using Mingrelian youth groups and forums rather than the National Educational Olympiad.

3 **Influencing the National Curriculum**

Ideally, we want to see the National Curriculum in Georgia changed to include more emphasis on teaching about Georgian rare plant and animal species and a greater understanding of the rich and diverse wildlife within Georgia along with the dangers posed by human activity. We are hoping that our pilot project in Samegrelo can be used as an example of how the project could be rolled out nationally in a more formal way. As our pilot project develops, we will be in regular contact with the Ministry of Education and Science to stimulate interest in changing the curriculum. It is understood that this would meet with some resistance to change and a certain amount of bureaucracy.

Therefore we will need to have progressed the Pilot Schools Programme for some while and accumulated a great deal of evidence before we can approach the Ministry with any serious proposals for change.

4 **Protected Area status**

We will petition the Georgian government to create a Protected Area for the mountainous area around Mt Migaria, Mt Jvari and Mt Askhi. The argument for this includes habitat conservation, conservation of rare plant species (*Betula megrelica*) and possibly conservation of endemic fauna (eg. brown bear *Ursus arctos).*

5 **Alternative timber sources**

To encourage foresters to reduce the felling of trees within the wild forest, it will be necessary to offer alternative wood sources. One option would be to plant quick growing trees in lower areas bordering farmland. Clearly this must not be done on prime agricultural land, but could be undertaken on under-used or poor land. Possibly a subsidy could be paid for creation and management of plantations. However, this would have to be off-set by control of wild timber extraction, otherwise there is nothing to stop the old traditions continuing alongside the plantations.

6 **Ex-situ collections**

Ex-situ collections are being established at Bakuriani Botanic Garden (Georgia) and Stone Lane Gardens (UK). We will continue to maintain and expand these collections. These collections have two main purposes:-

a) To preserve living collections of wild-origin material of known provenance, genetic purity and natural variation. This material can then be available for research and possible future re-stocking of wild populations.

b) To educate the public about rare species and the need for conservation. The ex-situ collections must be grown in areas that are easily accessed by the public, with appropriate high profile publicity and interpretation displays.

The two locations are both in gardens that are open to the public. We will design and create display boards to be erected at both gardens. In addition we hope to have a third collection at the National Botanic Garden of Georgia, which has much larger visitor numbers than Bakuriani. The SLG collection will also be the focus of research into the effects of different soil types and nutrient balances on germination and growth, ideally in conjunction with a University through a PhD placement. This will help understand the processes that determine why *B. megrelica* is dominant in it's niche habitat.

7 **In-situ monitoring of wild populations**

The threat from grazing and forestry operations makes it essential to monitor the wild populations. Regular checks on the health of these populations will highlight any damage caused by human activities. A regular presence may also help to educate the shepherds and loggers about the project. Another important aspect of this monitoring is the valuable opportunity to train new Georgian botanical staff in the field.

8 **Extending the Field work**

Whilst we have studied large parts of the Mt Migaria/Mt Jvari massif, more study of the newly discovered wild population on Mt Askhi is desirable. The 2015 expedition only

reached the edge of this population and had insufficient time to make a detailed study A more focussed field study expedition to Mt Askhi should take place at the earliest opportunity. In addition, soil and rock sampling and analysis need to be carried out in the region, to help understand the underlying geology of the habitats.

LONG TERM FUNDING

This project will require management and grass-roots funding for several years. BGCI and Stone Lane Gardens will actively pursue funding for this, as well as taking on a project management role. The Institute of Botany will manage the project at the local level in Georgia.