

JAMES RENNIE BEQUEST

REPORT ON EXPEDITION/PROJECT/CONFERENCE

Expedition/Project/ Conference Title: Mountain Waters of the Czech Republic

Travel Dates: 28th May 2011 – 11th June 2011

Location: The Jizera Mountains, Czech Republic

Group member(s): Alua Suleimenova

Aims: To learn and evaluate ecological strategies to rehabilitate the headwater areas in the Jizera Mountains (The Czech Republic) damaged by acid atmospheric deposition and commercial forestry.

OUTCOME

Introduction

My expedition was organised by the Earthwatch Institute and the Czech Technical University in Prague. It forms part of an ongoing research project conducted by Dr Josef Krecek and his colleagues from the Hydrology Department at the Czech Technical University.

My expedition was based in the Bedrichov village in the region of the Black Triangle where Poland, Germany and the Czech Republic come together. This area is an epicentre of acid atmospheric deposition in Europe, mainly due to sulphate from lignite combustion and inappropriate forestry practices. As a result, acid rain caused soil deterioration, whereas low pH values and high content of toxic metals in the surface waters led to extinction of freshwater fish and benthic invertebrates.

In 1991 the environmental ministers of Poland, Germany and the Czech Republic initiated the “Black Triangle Regional Programme” to bring the industrial plants into compliance with European standards. As a result, the atmospheric deposition of sulphate decreased, and nature protection and landscape restoration became more prominent issues.

Materials and Methods

Study Area

The expedition aimed to apply various hydrological techniques to examine atmospheric precipitation and open water bodies and to conduct a forest survey in reforested sites. The main study area was located in the Jizera Mountains region (350 km², latitude 50°40' to 50°52', longitude 15°08' to 15°24', humid temperate zone). The native tree species are represented by Norway spruce (*Picea abies*), common beech (*Fagus sylvatica*) and common silver fir (*Abies alba*). The research site is thought to have naturally low buffer capacity. Hence, the granite bedrock and shallow podzolic soils are very sensitive to acidification.

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Figure 1. The Jizera Mountains in the Black Triangle region

The area covers several nature reserves and protected landscapes. However, there are also many dying trees which have been weakened by acid rain and destroyed by bark beetle *Ips Typographus*.



Figure 2. "Tree Cemeteries" in the Black Triangle region

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Timeline

The first day of the expedition was devoted to the introduction to the project and preliminary investigation of the study area and acquiring skills required for field study. The next week was dedicated to collection and analysis of atmospheric precipitation and water samples from open reservoirs. The following week aimed to conduct a forest survey.

Collection and Analysis of Water Samples

Atmospheric precipitation was sampled in both open field (one storage gauge in an area of 250 cm²) and under the canopy (10 storage rain gauges in an area of 250 cm²) in two stands of Norway spruce and common beech of different ages, structures and vitality. Under the grass, rain was collected by modified gauges installed in the soil.

Surface water samples were taken from four vertical profiles of the drinking water reservoirs: Jizerka, Oldrichov, Sous and Josefuv Dul. The methodology included direct sampling from water bodies using stable ferry-boats equipped with a pair of oars (following local environmental policy).

All the samples were analysed for temperature, oxygen content, pH and conductivity. Some of the samples were sent to the laboratory of the Czech Technical University to be examined for their nutrient content.



Figure 3. Jizerka watershed



Figure 4. Rain gauge sampling

Forest Survey

Forest survey included forest stand inventory in the regions of Jizerka and Josefuv Dul on plots 20 m × 20 m. The inventory encompassed determination of species and evaluation of basic forest parameters (i.e. height, stand density, horizontal and vertical canopy density) by standard techniques. In addition, all the trees were evaluated for their vitality by measuring

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electric resistance in conductive layers of tree stems. Finally, soil around the trees was examined for pH value and moisture content.

Another task was to evaluate the role of grassland ecosystems in reforested sites. This included a random quadrat sampling (10 cm × 10 cm), identification of pioneer grass species and measuring their height and leaf area in a given quadrat. Overall, four grass species were found: *Calamagrostis villosa*, *Avenella flexuosa*, *Deschampsia caespitosa* and *Molinia caerulea*. Then the samples were cut and taken into the field lab for processing which included overnight drying (105°C) and measuring dry weight. Finally, the grass species were sent to the laboratory of the Czech Technical University to be analysed for their mineral content.



Figure 5. Soil pH and moisture content test



Figure 6. Processing of grass samples

Results and Discussion

Expedition Outcome

When water samples were analysed for hydrological parameters, it was found that atmospheric precipitation under the canopy had a lower pH than open field precipitation, because it retained acidity from tree stems and leaves. However, overall results revealed a significant environmental improvement reflected in lower acidity compared to historic data.

In terms of forest cover, old forest stands showed an increase in canopy density and vitality, whereas young species demonstrated a positive pattern of re-growth.

Personal outcome

The expedition equipped me with vital scientific skills such as collection and analysis of field data and application of technical devices such as pH meter, oxygen meter, clinometer, shigometer and tensiometer. In addition, I learnt how to set up rain and fog gauges and how to measure tree height using trigonometric methods. Furthermore, our daily expedition seminars and round tables allowed me to practice my presentation skills, improve my analytical abilities and critical thinking. Also I had a chance to meet interesting people from different parts of the world and make useful contacts with the principal investigator from the Czech Technical University and other researchers.

I was also keen on studying the surroundings, observing the plants and invertebrates in the area. This allowed me to improve my navigation and species identification skills.

Apart from research, my experience provided me with an insight into the Czech culture and history. By interacting with local people I had an opportunity to learn basic Czech language to apply it in simple conversations. This facilitated my adaptation to the new environment. Overall, I have learnt many useful research techniques and obtained the cultural impression of the Czech Republic.

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Dissemination of Results

After completion of my expedition in the Czech Republic I shared my experience and scientific results with other students by participating in the EUSci seminar which took place on the 28th July 2011. In addition I have submitted an article to "The Geographer", a newsletter published by the Royal Scottish Geographical Society. It is expected to issue in October 2011.

As a president of the Edinburgh University Expedition Society, I am planning to run "Expedition Show and Tell" session in 2011/12 academic year and share my experience with the Society members.

Acknowledgements

I gratefully acknowledge the financial support provided by the James Rennie Bequest which allowed me to cover my travel expenses associated with the expedition in the Czech Republic.