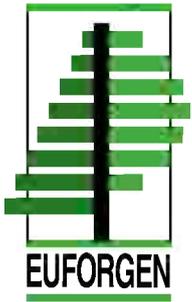


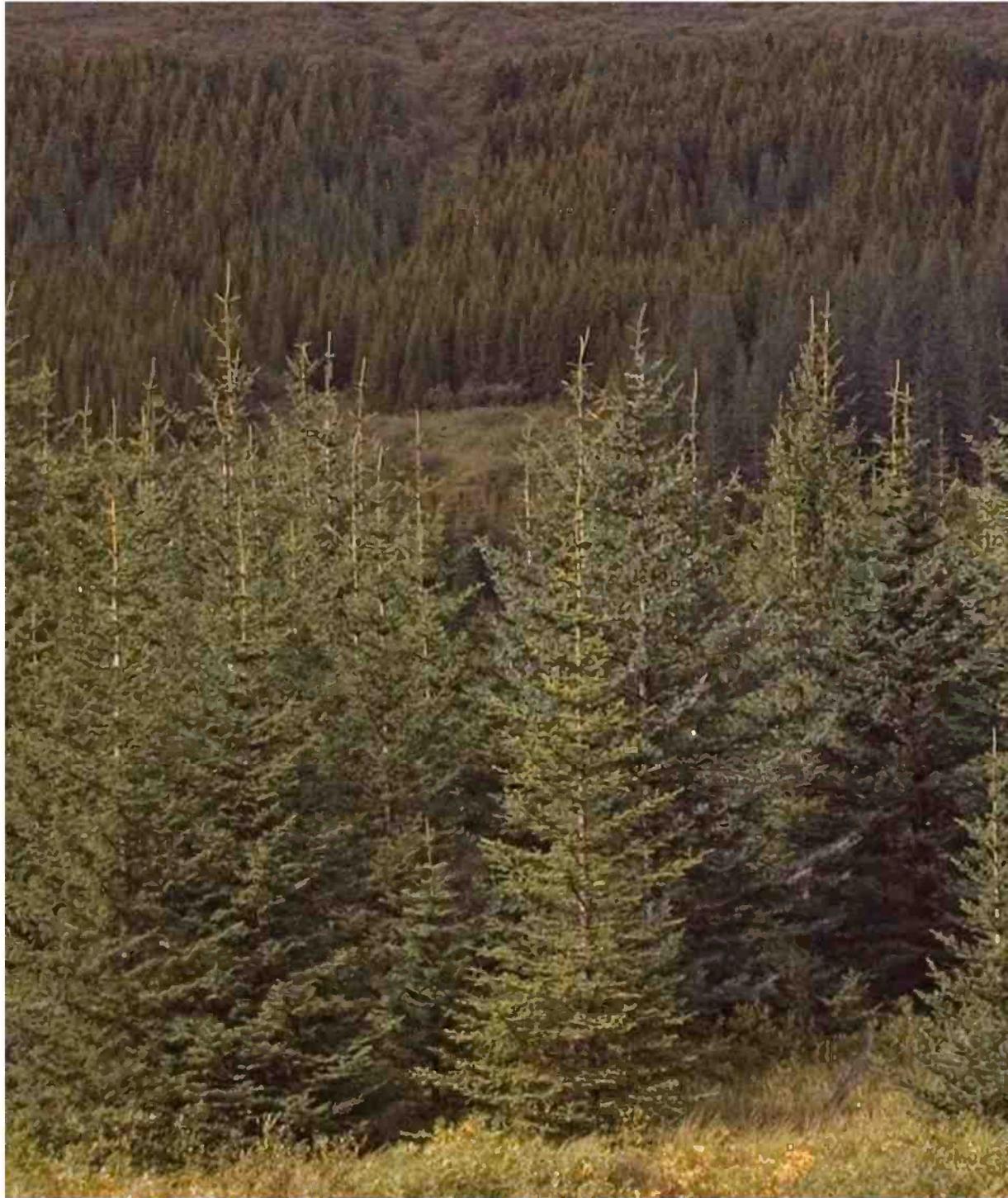
Conifers Network

Report of the fourth meeting (18–20 October 2003, Pitlochry, United Kingdom)

**J. Koskela, C.J.A. Samuel, Cs. Mátyás, and
B. Fady, compilers**



European Forest Genetic Resources Programme (EUFORGEN)



Conifers Network

Report of the fourth meeting (18–20 October 2003, Pitlochry, United Kingdom)

**J. Koskela, C.J.A. Samuel, Cs. Mátyás, and
B. Fady, compilers**

European Forest Genetic Resources Programme (EUFORGEN)

Bioversity International is an independent international scientific organization that seeks to improve the well-being of present and future generations of people by enhancing conservation and the deployment of agricultural biodiversity on farms and in forests. It is one of 15 centres supported by the Consultative Group on International Agricultural Research (CGIAR), an association of public and private members who support efforts to mobilize cutting-edge science to reduce hunger and poverty, improve human nutrition and health, and protect the environment. Bioversity has its headquarters in Maccaresse, near Rome, Italy, with offices in more than 20 other countries worldwide. The Institute operates through four programmes: Diversity for Livelihoods, Understanding and Managing Biodiversity, Global Partnerships, and Commodities for Livelihoods.

The international status of Bioversity is conferred under an Establishment Agreement which, by January 2007, had been signed by the Governments of Algeria, Australia, Belgium, Benin, Bolivia, Brazil, Burkina Faso, Cameroon, Chile, China, Congo, Costa Rica, Côte d'Ivoire, Cyprus, Czech Republic, Denmark, Ecuador, Egypt, Greece, Guinea, Hungary, India, Indonesia, Iran, Israel, Italy, Jordan, Kenya, Malaysia, Mali, Mauritania, Morocco, Norway, Pakistan, Panama, Peru, Poland, Portugal, Romania, Russia, Senegal, Slovakia, Sudan, Switzerland, Syria, Tunisia, Turkey, Uganda and Ukraine.

Financial support for Bioversity's research is provided by more than 150 donors, including governments, private foundations and international organizations. For details of donors and research activities please see Bioversity's Annual Reports, which are available in printed form on request from bioversity-cgiar.org or from Bioversity's website (www.bioversityinternational.org).

European Forest Genetic Resources Programme (EUFORGEN) is a collaborative programme among European countries aimed at ensuring effective conservation and sustainable utilization of forest genetic resources in Europe. It was established in 1994 to implement Resolution 2 of the Strasbourg Ministerial Conference for the Protection of Forests in Europe. EUFORGEN is financed by participating countries and is coordinated by Bioversity International, in collaboration with the Forestry Department of FAO. It facilitates the dissemination of information and various collaborative initiatives. The Programme operates through Networks in which scientists, managers and policy-makers work together to analyse needs, exchange experiences and develop conservation methods for selected tree species. The Networks also contribute to the development of appropriate conservation strategies for the ecosystems to which these species belong and promote integration of gene conservation into sustainable forest management. Network members and other experts from the participating countries carry out an agreed workplan with their own resources as inputs in kind to the Programme. EUFORGEN is overseen by a Steering Committee composed of National Coordinators nominated by the member countries. Further information on EUFORGEN can be found from its website (www.euforgen.org).

The geographical designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of Bioversity or the CGIAR concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. Similarly, the views expressed are those of the authors and do not necessarily reflect the views of these organizations.

Mention of a proprietary name does not constitute endorsement of the product and is given only for information.

Citation: Koskela, J., Samuel, C.J.A., Mátyás, Cs. and Fady, B., compilers. 2007. Conifers Network, Report of the fourth meeting (18-20 October 2003, Pitlochry, United Kingdom). Bioversity International, Rome, Italy. iv+71 pp.

ISBN 978-92-9043-768-0

Bioversity International
Via dei Tre Denari, 472/a
00057 Maccaresse
Rome, Italy

© Bioversity International, 2007

Contents

Summary of the fourth EUFORGEN Conifers Network meeting	1
Introductory country reports	13
Conifer genetic resources in Iceland	15
<i>T. Eysteinnsson</i>	
Single nucleotide polymorphisms in forest trees	19
Review on single nucleotide polymorphisms (SNPs) and population genetic studies in conifer species	21
<i>G.G. Vendramin</i>	
Genetic resources of exotic conifers	29
The introduction, evaluation and use of non-native conifer species in Britain	31
<i>C.J.A. Samuel</i>	
Breeding programmes of exotic conifers in Britain	35
<i>S. Lee</i>	
Developing a policy for long-term archiving of conifer breeding material	39
<i>R. Sykes</i>	
Introduced forest tree species: some genetic and ecological consequences	41
<i>B. Fady</i>	
Attempts in identifying the origin of Douglas-fir (<i>Pseudotsuga menziesii</i> (Mirb.) Franco) stands in Germany	53
<i>A.O. König, W. Maurer, H.P. Schmitt, W. Arenhövel, H.M. Rau and B.R. Stephan</i>	
Douglas-fir provenance tests in Serbia	61
<i>V. Isajev and V. Lavadinovic</i>	
Programme of the fourth meeting	67
List of participants	69

Summary of the fourth EUFORGEN Conifers Network meeting

Fourth EUFORGEN Conifers Network meeting, Pitlochry, Scotland, 18-20 October 2003

Opening of the meeting

C.J.A. Samuel welcomed the participants on behalf of local organizers and provided a short presentation on forestry in Scotland and the UK. He described how the forest sector is structured in the UK and stressed the importance of conifers, especially the role of exotic conifers in Scotland. He also introduced his colleagues from the Forest Research, i.e. C. Baldwin, E. Ker and R. Sykes.

C. Mátyás, Chair of the Network, welcomed the participants from 26 countries and thanked the local organizers for the arrangements. All participants then briefly introduced themselves.

The Chair reminded the Network members of the importance of producing visible and useful outputs. He highlighted the task of EUFORGEN which should support conservation activities in the participating countries. At the same time, EUFORGEN should raise awareness of forest genetic resources among forestry professionals, decision makers and the public in general.

J. Koskela introduced himself as the new EUFORGEN Coordinator since 1 January 2003. He then presented the tentative agenda of the meeting which was adopted with some amendments. J. Fennessy, B. Fady and T. Skrøppa were nominated as rapporteurs for the meeting.

EUFORGEN update

J. Koskela provided a short update on the two recent external reviews which were carried out on IPGRI¹: one assessed the performance of Bioversity International as a whole and the other focused solely on the Bioversity Regional Office for Europe. The two reviews were carried out as the regular five-year monitoring cycle of CGIAR and Bioversity activities, respectively. Results of both reviews were positive and several recommendations made during the Europe review were specifically addressed to the EUFORGEN Steering Committee. These recommendations will be presented to the Steering Committee for discussion during its next meeting in May 2004. He thanked those participants who responded to the Bioversity surveys which were sent to Bioversity's partners in Europe as part of the reviews.

J. Koskela informed the meeting that the new Director General of Bioversity, Dr. Emile Frison, commenced his duties on 1 August 2003. He then presented the reports on recent meetings and outputs of EUFORGEN and listed various other meetings where the Secretariat promoted the EUFORGEN Programme. He briefly highlighted the outputs of the 4th Ministerial Conference on the Protection of Forests in Europe (MCPFE), held in Vienna, Austria at the end of April 2003. The MCPFE Liaison Unit will move from Vienna to Warsaw by the end of 2003 as Poland takes the Chair in the MCPFE process. Relating to EUFORGEN activities, he informed the meeting that a collaborative capacity-building programme, 'Conservation and use of biological diversity for development', is being developed between Bioversity and the Government of Austria. It is planned that this initiative will include an international training programme on forest genetic resources. Its focus is on providing short-term training courses and scholarships, especially for developing countries and European countries in transition.

Introductory country report by Iceland

T. Eysteinnsson gave a general presentation on forestry in Iceland. The native tree species are birch, rowan and aspen, while common juniper is the only native conifer. Before human settlement, the native birch forests covered about 30% of the land area but currently the figure is only 1%. Modern forestry in Iceland started in 1899 with the first pine enclosures. In the 1940s, large-scale seed import took place for afforestation purposes and the period from 1960 to 1990 was known as a learning period with development of forest research. The present forest management goals are mainly multiple uses, with emphasis on timber production. Other important elements are soil conservation, land reclamation, amenity and recreation. The most important exotic conifers are Siberian larch, Sitka spruce and lodgepole pine.

¹ From 1 December 2006, IPGRI and INIBAP operate under the name Bioversity International.

Progress made in various countries

Central and Eastern Europe (Czech Republic, Hungary, Poland, Russian Federation, Slovakia and Slovenia)

Hungary, Slovakia and the Czech Republic reported that general insecurity in forest management has increased due to the ongoing transition process towards market economies. In the Czech Republic, for example, there are too many owners of small forests, and some of them do not have any particular interest in forest management. Some good results from the past have been lost after many personnel changes in various organisations. This situation has also increased lack of responsibility among those organisations which offer services in forestry and their staff have inadequate capacity to monitor activities at an appropriate level. Substantial changes in ownership structure have also taken place in Slovenia. In Hungary, large private owners have greater interest and they are doing more for FGR (forest genetic resources) conservation than state forest services. However, the privatisation process is sometimes less transparent and probably based on particular interests of individuals and groups.

The forests still face serious health problems, although the situation is improving in the Czech Republic with decreasing industrial pollution and emissions. Too high a number of large game species is a problem in Hungary and the Czech Republic. In recent years, extreme weather conditions, e.g. flood and drought, have increased stress on the forest ecosystems. Consequently, the frequency of bark beetle outbreak is increasing which creates a specific and long-lasting problem.

There are problems in communication between environmental NGOs, state agencies responsible for forests and those responsible for the environment. There are conflicting views regarding NATURA 2000 between private forest owners and representatives of environmental agencies. Russia reported that illegal logging and trade is continuing, particularly in the Far East, Siberia and the Caucasus region. Decreasing profitability of forestry and lack of funds for forestry activities is creating problems to conservation of FGR in Central and Eastern Europe.

Legislation changes in most countries are connected to the preparatory phase of accession to the EC requiring harmonisation of national legislation with the *acquis communautaire* (the entire body of European laws). In addition, national strategies and/or programmes on conservation and utilisation of FGR are in preparation in several countries and many newly adopted national forest programmes include chapters on FGR. Some of the ongoing projects on FGR and tree breeding include:

- Development of molecular and biochemical databases on forest trees for monitoring movement of forest reproductive material;
- Tree breeding and preservation of valuable and threatened populations;
- Silvicultural techniques and genetic composition of tree species;
- Reproduction methods such as vegetative propagation and *in vitro* culture;
- Approval and record keeping of forest reproductive material and information services for forest owners.

Increased public awareness is considered important and publications and videos are under preparation in Central and Eastern European countries.

Mediterranean region (Bulgaria, Croatia, Cyprus, France, Italy, Macedonia, Malta, Serbia and Montenegro, Spain and Turkey)

The Mediterranean eco-geographical group was represented by 10 countries. The species of interest for this group are: *Abies* spp., *Picea abies*, *Pinus pinaster*, *Taxus baccata*, *Pinus nigra*, *Pinus pinea*, *Pinus halepensis*, *Pinus brutia*, *Pinus peuce*, *Pinus heldreichii*, *Cupressus* spp., *Cedrus* spp., *Juniperus* spp. and *Tetraclinis articulata*.

Research projects on characterization of genetic resources of some Mediterranean conifer species (e.g. *Abies alba* in Croatia, *Pinus nigra* in Macedonia, Turkey, Serbia and Montenegro) are in progress using a combined approach with neutral and adaptive molecular markers. In France, Spain and Italy demography and parentage analyses are being carried out for *Abies alba*, *Pinus halepensis* and *Pinus pinaster*. The main objectives of these studies are to gather information on the distribution of neutral and adaptive variation in the natural range of the species, to identify 'hot spots' of diversity and to monitor gene flow. Maps were prepared using neutral markers regarding the distribution of genetic diversity of *Pinus pinaster*, *Pinus halepensis* and *Picea abies*. The results of these projects can be summarized as follows:

- New information on colonisation dynamics, gene flow and hybridisation processes as well as on migration of populations;

- First evidence on the distribution of adaptive variation at the molecular level for *Pinus pinaster*, *Pinus halepensis*, *Pinus nigra* and *Picea abies*;
- Development of methods for provenances and seed lot identification for *Pinus pinaster*;
- Establishment of new provenances trials and progeny tests for *Abies alba*, *Pinus nigra*, *Pinus brutia* and *Pinus halepensis* and analysis of quantitative traits.

Various *in situ* conservation measures have also been undertaken, including establishment of four additional conservation units for *Abies alba* in south-eastern France, revision of *Abies alba* seed stands in Croatia and identification of three additional gene conservation units for *Pinus brutia* in Turkey. For *ex situ* conservation, the number of *Pinus pinaster* and *Pinus halepensis* populations stored in seed banks has increased in France and Italy. Additional samples for DNA banks of *Pinus halepensis*, *Pinus pinaster*, *Picea abies*, *Abies alba*, *Picea omorika* and *Pinus brutia* have been stored at -80°C in Italy and France. In Bulgaria, the number and size of gene reserves for *Picea abies* and *Abies alba* have also increased.

Regarding changes in relevant policies, Spain, France, Turkey and Bulgaria have harmonized the Council Directive 1999/105/EC on the marketing of forest reproductive material in their legislation. In Spain, a National Committee on Breeding and Conservation of Forest Genetic Resources has been established to coordinate the activities of the different autonomous communities. Spain has recently also prepared a new forest law including aspects related to breeding and conservation of FGR. New laws on forest reproductive material have also been adopted in Serbia and Montenegro, and Macedonia. Public awareness and training activities include:

- Organization of the 2nd edition of an international course on conservation of FGR in Spain;
- Participation at the French Agricultural Exhibition "Our forests: a genetic treasure";
- Participation in TV programmes;
- Contribution to the preparation of books devoted to conservation genetics;
- An international course in Colombia was organised by Spain in collaboration with some South American countries.

Northern Europe (Finland, Iceland, Lithuania, Norway and Sweden)

At the Nordic level, conservation of genetic resources is one of the areas that have a high priority in the agricultural sector. The Nordic Genetic Resources Board was established with one representative from the Ministry of Agriculture and one from the Ministry of the Environment in each country.

On request from the Nordic Council of Ministers, a Nordic Network for Forest Tree Gene Conservation was established in 2003 with one representative from each Nordic country. This is similar to the Nordic Gene Bank for agricultural plants and the Nordic Gene Bank for farm animals. The objective is to promote and co-ordinate the conservation of genetic resources of forest trees in the region. Raising public awareness at different levels has a high priority in Nordic co-operation. The joint annual publication "Nordic GENresources" with contributions from all three sectors is one of the public awareness initiatives.

A report of the legal issues of genetic resources of agricultural plants, agricultural animals and forest trees was presented to the Nordic Council of Ministers in June 2003 (A Nordic Approach to Access and Rights to Genetic Resources, ANP 2003:717, 99pp, available free of charge from nrmr.dk). It recommended that legally, forest trees should be considered to be in the public domain. The Council decided, however, that the legal status of the genetic resources of forest trees is still unclear and that the topic should be further evaluated.

In Norway, efforts have been made to evaluate the role of nature conservation reserves in gene conservation. It seems that their role will be different both for species and countries. Investigations along the same lines are being initiated in Sweden and Finland. In Iceland, gene conservation has the highest priority in state-owned forests.

A pilot project monitoring the genetic resources of rare and scattered tree species was initiated in Norway. Abundance, size, distribution and damage by grazing animals was assessed in 1000 m² plots in a 3 x 3 km grid in three counties, as an additional registration in the national forest survey.

Breeding of Norway spruce and Scots pine is continuing both in Sweden and Finland with the establishment of new generation seed orchards. A long-term breeding strategy for Finland was presented this year. It has been evaluated and will be revised by the end of 2003. The breeding strategies in these two countries combine long-term breeding and gene conservation.

In Lithuania, a law on genetic resources of plants, including forest trees, came into force in 2003. A new gene bank as a state-funded institution for the management of plant genetic resources is under establishment. The area of the Norway spruce gene reserves in Lithuania has been reduced due to bark beetle outbreaks.

In both Iceland and Norway, it has been observed that rather fast development of landraces may take place in forest trees. This has been shown as adaptation to climatic conditions and susceptibility to the green spruce aphid in Sitka spruce.

Characterization using molecular markers in Norway spruce from the assumed refugia and along the migration routes is underway in Norway. Combined with results from dating pollen profiles, it will most likely provide new information about the immigration of the species after the last glacial period. In a joint Norwegian–Finnish project isozyme studies have been made for a large number of *Taxus baccata* populations from the western and northernmost range of the species.

Western Europe (Austria, Belgium, Germany, Ireland, Switzerland and United Kingdom)

In general, few major developments were reported among this group of countries. Difficulties in obtaining data were highlighted. These were due to insufficient resources and low interest in genetic conservation in conifers.

Switzerland reported the successful publication of a Gene Conservation Concept, a document covering all forest tree species (published in French and German only). Forests of special genetic interest are presently being identified.

A symposium on Genetic Conservation and Breeding of *Taxus baccata* was held in Austria. Forthcoming work is in hand to investigate molecular methods to be used as diversity measures and for seed lot identification across a range of species.

In Germany, the National Concept on the conservation of forest genetic resources was last reviewed and published in 2000. All activities are coordinated by a national working group and the reporting period runs from 2001 to 2004. At this stage, only reports from some federal states have been received as levels of activity among states are variable. The following list summarises these activities:

- For several species (*Abies alba*, *Picea abies*, *Taxus baccata*, *Pseudotsuga menziesii*), stands, populations in experiments or individuals have been characterized by isozyme markers;
- The establishment of clonal archives, seed orchards and conservation plantations has continued;
- A IUFRO (International Union of Forest Research Organizations) meeting on 'Ecology and silviculture of Silver fir' was held in September 2002 with some 30 contributions;
- For *Pseudotsuga menziesii* a number of states have checked several hundred stands to assess their adaptation and suitability for further propagation (seed collection) and natural regeneration. Isozyme analyses have been applied using the allele frequencies of the 6-PGDH-A locus to distinguish between sources of the coastal and interior type. However, morphological characters such as needle cast, poor stem form, resin flow, early and heavy coning and mortality have been considered as undesirable characters;
- In an EU-funded project, possible changes in the genetic structure of populations transferred from North America to Europe have been investigated.

Documentation, information and public awareness

EUFORGEN website and bibliography

J. Koskela presented the new structure of the EUFORGEN website, which is accessible directly through a new address (www.euforgen.org) while the old address under the Bioversity website also remains operational. The website is database-driven and includes a number of new features such as a 'what's new' section, species summary pages and an improved search engine. The EUFORGEN grey literature database is maintained as part of the new website and it currently includes nearly 2000 references. There is a need to include information on where to find a given reference and it was decided to indicate network members as contact persons in each country.

Conifers and EUFORGEN posters

An updated version of the Conifers Network poster and a general EUFORGEN poster were displayed and copies in A4 size were distributed to the participants. The Network poster was originally developed for the DYGEN (Dynamics and Conservation of Genetic Diversity in Forest Ecosystems) Conference

and revised for the World Forestry Congress. These posters as well as other Network posters are available from the EUFORGEN website.

Image database

B. Fady updated Network members on the progress made on the image collection database. The participants were asked to provide additional slides on threats (pollution, pests and diseases), silviculture, utilization, genetics and breeding before 30 November 2003. Slides should be provided with the following information: name of photographer, country, species, item number and any additional comments. A reminder will be sent to all participants after the meeting. It was agreed that photos can be used freely for public awareness purposes provided that the name of the photographer and EUFORGEN (e.g. B. Fady/EUFORGEN Conifers Network) are acknowledged.

T. Skrøppa gave a presentation on the Norwegian website on conservation of forest tree genetic resources (http://www.skogoglandskap.no/temaer/genetic_resources). On this website, detailed information can be found on strategies for forest tree gene conservation in Norway, and related issues.

Meetings, projects and other initiatives

Outcomes of the DYGEN Conference

C. Mátyás reported outcomes of the Dynamics and Conservation of Genetic Diversity in Forest Ecosystems (DYGEN) Conference, which was held in Strasbourg in December 2002. Most topics discussed during the conference have relevance for developing strategies for genetic conservation, such as mating and population size, effects of post-glacial migration and of human activity on genetic structure, or the impact of past and future climatic changes.

There is no doubt that maintaining the dynamics of evolution and adaptation must remain the main goal of gene conservation. In view of expected long-term environmental changes, adaptability and phenotypic plasticity are traits of primary importance. However, the gap between molecular marker data and adaptive traits is still not overcome. In this respect the legacy of post-glacial migrations (organellar lineages) provides limited support, and historic differences have been erased by selection and gene flow.

Important strategic issues, such as the role of science in shaping forest policy, were also discussed during the DYGEN Conference. There was general agreement that genetic issues must be made more visible for decision-makers and the general public. The summaries of the conference sessions are published in the latest issue of *Forest Genetics* (2002, 9(4):333-340) and selected papers will be published in *Forest Ecology and Management*.

EVOLTREE proposal

G.G. Vendramin provided a short overview of the proposal submitted to the European Commission for the creation of a network of excellence on genomics of forest tree species. The title of the proposal is Evolution and Management of Diversity in European Forest Trees (EVOLTREE). EVOLTREE aims to implement genomic approaches for monitoring, predicting and managing genetic diversity in European forest trees for sustainable resource management and environmental protection. The aim of EVOLTREE is to transfer basic knowledge of gene function and genetic diversity into the forest sector, both by improving management practice and by tracing wood or seed products. It integrates interdisciplinary research (genomics, population and quantitative genetics, ecology, eco-physiology, palaeoecology, reproductive biology, modelling, bioinformatics, conservation biology, silviculture) to decipher the structure, expression and polymorphism of genes of adaptive significance and attempts to gain new insight into ecosystem function.

EVOLTREE is a consortium of 32 partners from 14 different countries. Besides the very positive scientific evaluation, the proposal was rejected because forest genomics was not considered as a high priority topic. It is the intention of the coordinator (A. Kremer) to resubmit the proposal. Possible changes in the content and eventually in the partnership will depend on the final version of the next call (Topic III.1.3) that will be published in January 2004.

Results of analyzing SNPs in conifers

G.G. Vendramin gave a talk about the detection and usefulness of a new category of markers, namely single nucleotide polymorphisms (SNPs), for population genetic studies in conifer species. Direct analysis of genetic variation at the sequence level using SNPs offers several advantages over other types of DNA marker systems. Information about the frequency and distribution of SNPs in forest tree species is still lacking.

The work consisted of a preliminary analysis of SNPs distribution in Aleppo pine (*Pinus halepensis*) and the evaluation of their usefulness in population genetic analyses. Based on isozymes, nuclear and chloroplast microsatellite data, it appears to carry high levels of variability, most of which (>85%) resides within populations. In this first phase attention was paid to a CAD gene, which is involved in lignin biosynthesis. Five populations sampled in different parts of the natural range (Israel, Greece, Italy, Spain and Morocco) of the species were analyzed.

Based on preliminary data from about 1200 bp (base pairs), the frequency of nucleotide changes appears to be high, with an average of one SNP every 143 bases overall. This frequency, which is much higher than that observed in humans, appears to be lower (but of the same magnitude) than frequencies observed in maize, *Picea abies* and *Pinus pinaster*, which are commonly considered species with extremely high levels of variability.

The estimated value of nucleotide variation appeared low. On the other hand, the genetic differentiation among populations was higher (about 42%) than that estimated using neutral markers (ranging from 2–12%), suggesting that this gene is under selection. The analysis of SNPs in candidate genes was a first attempt to detect putative adaptive variation and may provide extremely useful information for designing conservation units.

New EC Regulations on Genetic Resources in Agriculture

J. Koskela reported on the development of new EC Regulations on Genetic Resources in Agriculture. The EC is currently working on a revision of Regulation 1467 from 1994. The draft proposal was presented and discussed during two meetings held in Brussels in early 2003. The focus of this new regulation will be on animal gene conservation and the budget will be €7–10 million for a period of three years. The scope of the Regulation also includes crop, microbial and forest genetic resources with the focus on conservation, characterization, collection, utilization, documentation and evaluation. On-farm conservation and inventories are also likely to be eligible but research activities are specifically excluded. EUFORGEN is mentioned as the only forest-related framework in the draft document. The first call is expected to open by the end of 2003 or early 2004, and a second call is scheduled for 2005 after ten new countries have joined the EU. The Regulation is expected to provide funding for one or two forest-based projects. It was suggested that a proposal could be developed based on the common action plan concept.

In addition to the EC Regulation on genetic resources, the participants discussed the EC Directive on forest reproductive material. Concern was expressed that this might lead to inappropriate use of forest reproductive material.

Progress made in the Network activities

Technical Guidelines

J. Koskela provided an update on the state of the Technical Guidelines (TGs) production process. The six-page Technical Guidelines are specifically targeted for forest managers while Technical Bulletins are more comprehensive presentations of relevant information targeted for both scientists and managers. The first set of TGs was published in April 2003, including *Picea abies*, *Pinus pinaster* and *Pinus brutia/halepensis*. Two new TGs for conifers (*Abies alba*, *Pinus sylvestris*) will be published as part of the second set in November 2003. A third set is scheduled for publication in February 2004. The state of the various conifer TGs is as follows:

- *Abies alba* (Heino Wolf): text has been circulated and the draft map will be distributed shortly.
- *Pinus sylvestris* (Csaba Mátyás, Sam Samuel, Lennart Ackzell): draft will be sent to the Secretariat soon after the meeting.
- *Taxus baccata* (Rudolf Bruchanik, Ladislav Paul) draft text was provided just before the meeting.

- *Pinus nigra* (Vasilije Isajev, Bruno Fady, Hacer Semerci, Vlatko Andonovski): deadline for the draft text is 15 Jan 2004.
- *Pinus cembra* (Marcus Ulber, Gregor Bozic, Felix Gugerli): final text is ready for circulation.
- *Larix decidua* (Jan Matras): draft text was provided during the meeting.
- *Juniperus communis* (Sam Samuel, Vahid Hadjiyev, Maia Akhalkatsi, Mikhail Pridnya): This was rescheduled for future publication and it was agreed that *Pinus peuce* would be prepared by Alexander Alexandrov and Vlatko Andonovski (deadline for text is 30 December 2003).
- *Pinus pinea* (Giuseppe Vendramin, Bruno Fady, Sonia Martin): draft text will be provided by 30 November 2003.
- *Pinus leucodermis*/ *P. heldreichii* (Giuseppe Vendramin, Bruno Fady): draft text will be provided by 30 November 2003.

Best practice for genetically sustainable forest management

C. Matyas informed the meeting that the paper published in Hungarian is now available in English. However, it was agreed that this issue was more relevant to the whole of EUFORGEN and that it should be directed to the next Steering Committee meeting in 2004.

Common action plan

The goal is to establish a pan-European network of *in situ* gene conservation units using *Picea abies* as a model species. Only a few contributions were received; in part due to lack of a clear definition of *in situ* gene conservation units. The table will be modified to include different categories of *in situ* conservation areas (e.g. gene reserves, seed stands, national parks, strictly protected areas). The Secretariat will send out a revised table and the definitions to the participants shortly and they should provide data currently available to the Secretariat by 15 December 2003.

List of priority species

The list of priority conifer species was discussed and it was agreed that the scoring would be changed from ten classes to four. The four classes are: 1) high priority, 2) medium priority, 3) low priority and 4) no priority. In the case of a species not used in forestry in a country, the table should indicate a blank. The Secretariat will provide an updated table with existing priority species for the participants to be scored. If needed, new species can be added into this table. The deadline for providing the priority species to the Secretariat is 30 November 2003.

After receiving feedback, the Secretary will then finalise the table and divide the last column (number of countries in which a given species received scores) into four sub-columns indicating the number of countries per each priority class.

Outputs of the MCPFE process and development of EUFORGEN Phase III

J. Koskela presented recent outputs from the MCPFE process, i.e. the fourth Ministerial Conference on the Protection of Forests in Europe (28–30 April 2003) and the Expert Level Meeting (16–17 Oct 2003), both held in Vienna, Austria. After the EUFORGEN Steering Committee meeting in Sweden in June 2002, a task force produced a EUFORGEN strategy paper for the preparatory process of the Vienna Ministerial Conference. Based on this paper and other efforts, conservation of FGR was highlighted in the Vienna outputs.

At the Vienna Ministerial Conference, the European ministers responsible for forestry and the EC committed themselves to “take further steps to maintain, conserve, restore and enhance biological diversity of forests, including their genetic resources, in Europe and also on a global scale” (paragraph 22 of the Vienna Declaration). In Resolution 4 on Forest Biological Diversity, the ministers also committed themselves to “promote the conservation of forest genetic resources as an integral part of sustainable forest management and continue the pan-European collaboration in this area” (paragraph 16).

Following the Vienna Ministerial Conference, the Liaison Unit organized the Expert Level Meeting to finalise a draft Work Programme, which was prepared by the Liaison Unit and the countries coordinating the MCPFE process. The draft Work Programme did not include FGR as a focus area. However, the EUFORGEN Secretariat provided feedback to the Liaison Unit and proposed several actions to be added

into the Work Programme during the Expert Level Meeting. The adopted Work Programme now includes FGR as a focus area under the Vienna Resolution 4 (Forest Biological Diversity) with two actions: 1) Promote conservation of forest genetic resources as an integral part of sustainable forest management and continue pan-European collaboration in this area through EUFORGEN and 2) International training programme on FGR as part of the collaborative capacity building programme 'Conservation and use of biological diversity for development' that is being developed between Bioversity and the Government of Austria. Furthermore, under Resolution 5 (Climate Change and Sustainable Forest Management) and focus area 'Adaptability of forests', the Work Programme includes a workshop on the role of genetic diversity in improving adaptability of forests to climate change and in maintaining the productivity of forests under changing environmental conditions. IUFRO and EUFORGEN/Bioversity were identified as leading agencies to organize this workshop in 2005.

These MCPFE outputs imply that EUFORGEN Phase III should continue implementation of the Strasbourg Resolution S2 on Conservation of Forest Genetic Resources and as a new element, also contribute to implementation of the Vienna Resolution V4 on Forest Biological Diversity by better linking gene conservation and forest management.

The participants then discussed the future of EUFORGEN and concluded that the Programme should continue for its third phase. The participants identified several issues that are relevant to future work. The discussion emphasized that EUFORGEN should play an important role in advising national programmes on FGR and that genetic considerations should be included in forest management. Conifers should be addressed regardless of how EUFORGEN will be organized in Phase III. Exotic conifers of importance for European forestry should be included in work plans for Phase III. The participants also highlighted need for better linkages between EUFORGEN and processes on forest biological diversity at global and pan-European levels. EUFORGEN should also promote cross-sectoral co-operation in natural resource management with all relevant stakeholders.

Seminar on conserving and using exotic conifers

The International Conifer Conservation Programme (M. Gardner)

M. Gardner gave a presentation on conservation activities of threatened conifer species. Globally there are about 800 conifer species of which 355 are listed by IUCN-The World Conservation Union as being of conservation concern. They are threatened by logging, fire, insect attacks and invasive species. Seventy may become extinct in the near future. He also provided several examples of threatened conifer species at global level. The major focus of the International Conifer Conservation Programme is the integration of *ex situ* with *in situ* conservation through scientific research, education and training, and cultivation. He also described the Global Strategy for Plant Conservation adopted in The Hague in April 2002 at the sixth meeting of the Conference of the Parties (COP) to the Convention on Biological Diversity (CBD). The Strategy attempts to deliver several outputs by 2010 including an assessment of the conservation status of all threatened plant species, ensuring that 60% of all threatened plant species are conserved both *in situ* and *ex situ*.

The introduction, variation and use of non-native conifer species in Britain (C.J.A Samuel)

C.J.A. Samuel commenced his presentation by giving some historical information on the many plant collectors, mainly Scottish, who introduced different exotic conifer species into Britain. He then presented 20th century trends in the use of conifers in the UK. Around 400 provenance experiments were established over the period 1926–1985. Results have revealed good increases in production from up to ten degrees transfer northwards in latitude on appropriate sites for North American conifers.

Before the late 1960s, the problems in establishing provenance trials related to limited seed availability (mainly commercial seed lots and lack of information on collection methods), population sizes and sampling. In the 1960s, IUFRO developed guidelines on sampling natural populations, co-ordinated seed collections and improved trial design. In conclusion, he raised a number of different questions on the conservation and use of exotic conifer species in the UK.

Breeding programmes of exotic conifers in Britain (S. Lee)

S. Lee presented a paper on breeding programmes of exotic conifers in the UK (Sitka spruce, Douglas-fir, lodgepole pine, Corsican pine and hybrid larch) and one native species, Scots pine. He reported progress made since the activities were initiated and provisions made for genetic conservation. He also

provided some details on tree selection and progeny testing in these species. The objective was to breed for timber suitable for the construction industry. Tested clonal seed orchards established at a number of locations were now in production and improved seed for vegetative propagation was obtained through artificial pollination. Similar programmes were developed for a number of species. In conclusion, he highlighted pressures on tree breeders due to a shift to multi-purpose forestry and the increasing use of native species.

Developing a policy for long-term archiving of breeding material (R. Sykes)

R. Sykes presented a paper on clonal archiving in the UK breeding programme. This programme started in the 1950s and all selections were routinely archived until the late 1970s. The early material grew to inaccessible heights for pollination work and resulted in the introduction of top pruning in the 1980s. This policy was reviewed in the 1990s. He described the structure and layout of the early clonal archiving system. As a result of the review, a new archiving system was introduced. In future, as well as clones from the breeding population, a proportion of those originally selected will be retained to supply any future breeding material which may be needed in response to changing selection objectives.

Introduced forest tree species: some genetic and ecological consequences (B. Fady)

B. Fady presented a paper on handling exotic species from the genetic conservation point of view using *Cedrus atlantica* as a case study. The presentation aimed at evaluating some of the genetic and ecological consequences of species introduction for the management of both local ecosystems and the introduced species. He presented evidence that introduced forest species may have a very significant genetic and ecological impact on local ecosystems. Using examples drawn from research carried out at INRA-Avignon (French National Institute for Agricultural Research) on *Cedrus* species, he also demonstrated that introduced tree species experience rapid and quite considerable ecological and genetic change. They seem to evolve quickly into new landraces as a result of selection, genetic drift, population admixture and changes in spatial structure of their mating system. Several aspects relevant for *in situ* and *ex situ* conservation of introduced resources, both in their new and original environments, were presented.

Identifying origins of Douglas-fir (*Pseudotsuga menziesii*) plantations in Germany (A. König)

A. König made a presentation demonstrating how several Federal States of Germany monitor their Douglas-fir stands to conclude on their adaptation and suitability for future silvicultural use. In general, provenance trials have demonstrated that interior provenances are maladapted and exhibit inferior characteristics when planted in Germany. Forest administrations want to exclude unsuited stands from further propagation either as seed stands or for natural regeneration. Rhineland-Palatinate, Northrhine-Westfalia and Thuringia used different frequencies of alleles at the 6-PGDH-A isozyme locus in order to discriminate between provenances/stands of coastal and interior origins. The State of Hesse, however, assessed maladaptation on the basis of several phenotypic characteristics, such as needle discolouration, needle cast, growth distortions, extraordinary coarse branches, resin flow and mortality after the establishment phase.

Douglas-fir provenance tests in Serbia (V. Isajev and V. Lavadinovic)

It is a very common practice to introduce exotic conifers as garden specimens in several parts of Serbia but little attention is paid to provenances. In a Douglas-fir provenance trial 31 different provenances were introduced from Washington, Oregon and New Mexico. They were established some 25 years ago at two sites with different environmental conditions and different elevations. Two Oregon provenances had the best performance at both sites.

Conclusions based on the seminar and the discussions

In many European countries, public opinion favours native tree species over exotics. Despite obvious mistakes made in cultivation of exotic conifers, their role in production forestry and amenity is undisputed, especially in countries/regions with a low percentage of remaining native forests or impoverished dendroflora (Ireland, UK and Iceland).

The meaning and importance of autochthony should be understood in broader terms. This is due to human impact on site conditions, extensive use of genetically improved forest reproductive material and predicted climate change. Therefore, the use of non-native material under clearly defined conditions should be considered as an acceptable option.

The cultivation of exotic species may have certain ecological and genetic consequences which have to be monitored carefully (e.g. diversity loss of ecosystems and introgression). In some species, disease and pest problems develop only after a considerable time lag and may be difficult to eradicate due to lack of natural control.

Analyses of second-generation performance of some introduced tree species show that adaptation to new environmental conditions can be relatively fast and consequently the gene pool may change significantly within one generation. This fast adaptational process may lead to the emergence of landraces. Such locally adapted genetic material should be conserved by appropriate methods.

Breeding strategy and policy changes can lead to changes in the current valuation of species. The proper conservation of selected/improved genotypes and archiving of pertinent information are important.

Traditional plantings of exotic species in arboreta are useful for public awareness. Recent initiatives of arboreta to develop conservation programmes of threatened forest tree species are also valuable from a genetic point of view.

Exotic tree species should be incorporated in both the national programmes of FGR conservation and in the multilateral programmes of EUFORGEN and other international organisations.

Any other business

- Iceland indicated its interest in join EUFORGEN.
- A. Alexandrov informed the meeting that an IUFRO 5-needle pine meeting will be held in Bulgaria 3–7 September 2004.
- Missing contributions to the meeting report should be sent to the Secretariat by 15 December 2003.

Date and place of next meeting

Cyprus indicated its interest to organise the next meeting in spring 2005. The offer was accepted, provided that the Conifers Network will continue in its present form during Phase III of EUFORGEN.

Adoption of the summary of the meeting

The meeting summary was adopted and the Chair (C. Mátyás) closed the meeting.

Introductory country reports

Fourth EUFORGEN Conifers Network meeting

Pitlochry, Scotland, UK, 18–20 October 2003

Theme: conservation and use of genetic resources of exotic conifer species in Europe

Friday 17 October

Arrival of participants

Saturday 18 October

- | | |
|-------|---|
| 08:30 | Opening of the meeting
Welcome address (S. Samuel)
Welcome by Chair (C. Mátyás)
Adoption of the agenda and nomination of rapporteurs |
| 08:45 | EUFORGEN update (J. Koskela) |
| 09:00 | Country introductory report: Iceland |
| 09:30 | Country updates and discussion on the progress made in sub-regional groups
Central and Eastern Europe (Czech Republic, Hungary, Poland, Russian Federation, Slovakia)
Mediterranean region (Bulgaria, Croatia, Cyprus, France, Italy, Macedonia, Malta, Serbia and Montenegro, Spain, Turkey)
Northern Europe (Finland, Lithuania, Norway, Sweden)
Western Europe (Austria, Belgium, Germany, Ireland, Switzerland, United Kingdom) |
| 10:30 | Break |
| 11:00 | Presentations by the sub-regional groups |
| 12:00 | Documentation, information and public awareness:
EUFORGEN website (J. Koskela)
Bibliography (J. Koskela)
Poster presented at the DYGEN Conference (C. Mátyás)
Image database (B. Fady)
Other public awareness initiatives |
| 12:30 | Lunch |
| 13:45 | Depart for Blair Castle (residence of the Dukes of Atholl for over 700 years) and Diana's Grove (major mature collection of exotic conifers) |
| 16:45 | Break |
| 17:00 | Meetings, projects and other initiatives:
Outcomes of the DYGEN Conference (C. Mátyás)
EC Regulation on Genetic Resources (J. Koskela)
EVOLTREE proposal (G. Vendramin)
Some results from analysing SNPs in conifers (G. Vendramin)
Other initiatives |
| 19:30 | Dinner |

Sunday 19 October

- 08:30 Progress made in the Network activities and discussion:
Technical Guidelines (J. Koskela)
Best practice for genetically sustainable forest management (C. Mátyás)
Common Action Plan (C. Mátyás)
List of priority species (C. Mátyás)
MCPFE outcomes and EUFORGEN Phase III (J. Koskela)
- 10:30 Break
- 11:00 Seminar on conserving and using exotic conifers: experiences from the UK and implications for Europe
The introduction, variation and use of non-native conifer species in Britain (S. Samuel)
Breeding programmes in exotic conifers in Britain (S. Lee)
- 12:30 Lunch
- 14:00 Seminar (continued):
Developing a policy for long-term archiving of breeding material (R. Sykes)
Handling exotic species from the genetic conservation point of view: *Cedrus atlantica* in France (B. Fady)
- 15:30 Break
- 16:00- 18:00 Botanical gardens and gene conservation (M. Gardner)
Seminar wrap-up and recommendations
- 20:00 Dinner

Monday 20 October

- 08:30-15:30 Field trip
- 16:00- 18:00 Wrap-up session:
Any other business
Date and place of next meeting
Adoption of the summary of the meeting
- 20:00 Dinner

Tuesday 21 October

- Departure of participants

List of participants

Michael Mengl
Federal Office and Research Centre for Forests
Institute of Forest Genetics
Hauptstrasse 7
1140 Vienna
Austria
Tel: (43-1) 87838 2224
Fax: (43-1) 87838 2250
Email: michael. bfw.gv.at

Olivier Desteucq
Centre de Recherche de la Nature, des Forêts et
du Bois
Avenue Maréchal Juin, 23
5030 Gembloux
Belgium
Tel: (32-81) 626452
Fax: (32-81) 615727
Email: o. mrw.wallonie.be

Alexander Alexandrov
Forest Research Institute
Kliment Ohridski Blvd 132
1756 Sofia
Bulgaria
Tel: (359-2) 9620442
Fax: (359-2) 9620447
Email: bulnet.bg

Marilena Idzajt
University of Zagreb
Faculty of Forestry
Svetosimunska 25
1000 Zagreb
Croatia
Tel: (385-1) 2352541
Fax: (385-1) 2352505
Email: marilena. post.hinet.hr

Karel Vancura
Forestry Development Department
Ministry of Agriculture
Tešnov 17
117 05 Prague
Czech Republic
Tel: (420-2) 2181 2357
Fax: (420-2) 2181 2988
Email: mze.cz

Xenophon Hadjikyriacou
Forestry Department
1414 Nicosia
Cyprus
Tel: (357) 22805504
Fax: (357) 22781419
Email: yahoo.com

Teijo Nikkanen
Punkaharju Research Station
Finlandiantie 18
58450 Punkaharju
Finland
Tel: (358-10) 2114226
Fax: (358-10) 2114201
Email: teijo. metla.fi

Bruno Fady
Unite des Recherches Forestières
Méditerranéennes – INRA
Avenue A. Vivaldi
84000 Avignon
France
Tel: (33-4) 90135910
Fax: (33-4) 90135959
Email: avignon.inra.fr

Armin König
Institute for Forest Genetics and Forest Tree Breeding
Sieker Landstrasse 2
22927 Grosshansdorf
Germany
Tel: (49-4102) 696147
Fax: (49-4102) 696200
Email: holz.uni-hamburg.de

Csaba Mátyás
University of West Hungary
Faculty of Forestry
PO Box 132
9401 Sopron
Hungary
Tel: (36-9) 518395
Fax: (36-99) 329840
Email: emk.nyme.hu

John Fennessy
COFORD (National Council for Forest Research
and Development)
Agriculture Building
Belfield
Dublin 4
Ireland
Tel: (353-1) 7167700
Fax: (353-1) 7161180
Email: john. coford.ie

Giovanni G. Vendramin
Istituto di Genetica Vegetale – CNR
Via Madonna del Piano
50019 Sesto Fiorentino
Italy
Tel: (39) 055 5225725
Fax: (33) 055 5225729
Email: giovanni. gv.cnr.it

Darius Danusevicius
Department of Forest Genetics and Reforestation
Lithuanian Forest Research Institute
Girionys 1
4312 Kaunas region
Lithuania
Tel: (370-7) 547426
Fax: (370-7) 547446
Email: darius. takas.lt

Vlatko Andonovski
Faculty of Forestry
P.O. Box 235
1000 Skopje R.
Macedonia FYR
Tel: (389-70) 332113
Fax: (389-2) 3079748
Email: unet.com.mk

Eman Calleja
Ministry of Agriculture and Fisheries
Department of Agriculture
Notabile Road
Attard
Malta
Tel: (356) 21415488
Fax: (356) 21493176
Email: eman. magnet.mt

Tore Skrøppa
Norwegian Forest Research Institute
Høgskoleveien 12
1432 Ås
Norway
Tel: (47) 64 949067
Fax: (47) 64942980
Email: tore. skogforsk.no

Jan Matras
Forest Research Institute
Dept. of Genetics & Physiology of Woody Plants
ul. Bitwy Warszawskiej 1920 roku, 3
00 973 Warsaw
Poland
Tel: (48-22) 7150478
Fax: (48-22) 7150313
Email: bles.waw.pl

Mikhail Pridnya
NIIGORLESECOL
74 Kurortnyi prospect
354002 Sochi-2
Russian Federation
Tel: (7-8622) 621842
Fax: (7-8622) 621842
Email: sochi.ru

Vasilije Isajev
Šumarski Fakultet – Beograd
Kneza Višeslava 1
11030 Belgrade
Serbia and Montenegro
Tel: (381-11) 553 122
Fax: (381-11) 545 485
Email: hotmail.com

Rudolf Bruchánik
State Forest of Slovak Republic
Námestie SNP 8
975 66 Branská Bystrica
Slovakia
Tel: (421-48) 4125903
Fax: (421-48) 4125904
Email: lesy.sk

Gregor Bozic
Slovenian Forestry Institute
Vecna pot 2
1000 Ljubljana
Slovenia
Tel: (386-1) 2007821
Fax: (386-61) 273589
Email: gregor. gozdis.si

Sonia Martín Albertos
Servicio de Material Genético
Dirección General de Conservación de la Naturaleza
Gran Vía de San Francisco, 4
28005 Madrid
Spain
Tel: (34-91) 5964639
Fax: (34-91) 5964905
Email: mma.es

Jonas Bergquist
National Board of Forestry
Skogstyrelsen
55183 Jönköping
Sweden
Tel: (46-36) 155720
Fax: (46-36) 166170
Email: jonas. svo.se

Marcus Ulber
Eidgen. Forschungsanstalt WSL
Zürcherstrasse 111
8903 Birmensdorf
Switzerland
Tel: (41-1) 7392493
Fax: (41-1) 7392215
Email: marcus. wsl.ch

Hacer Semerci
 Forest Tree Seeds & Tree Breeding
 Research Directorate
 P.O. Box 11
 06560 Gazi-Ankara
Turkey
 Tel: (90-312) 2126519
 Fax: (90-312) 2123960
 Email: yahoo.com AND
 hotmail.com

C.J.A. Samuel
 Forest Research
 Northern Research Station
 EH25 9SY Roslin, Midlothian
United Kingdom
 Tel: (44-131) 4456927
 Fax: (44-131) 4455124
 Email: c.j.a. forestry.gsi.gov.uk

Observers

Jon Loftsson
 Iceland Forestry Service
 Box 98, IS 700 Egilsstaðir
Iceland
 Tel: (354-471) 2100
 Fax: (354-471) 2172
 Email: skogur.is

Adalstein Sigurgeirsson
 Iceland Forestry Service
 Box 98, IS 700 Egilsstaðir
Iceland
 Tel: (354-471) 2100
 Fax: (354-471) 2172
 Email: skogur.is

Throstur Eysteinnsson
 Iceland Forestry Service
 Box 98, IS 700 Egilsstaðir
Iceland
 Tel: (354-471) 2100
 Fax: (354-471) 2172
 Email: skogur.is

Cathleen Baldwin
 Forest Research
 Northern Research Station
 EH25 9SY Roslin, Midlothian
United Kingdom
 Tel: (44-131) 4456927
 Fax: (44-131) 4455124
 Email: cathleen. forestry.gsi.gov.uk

Esther Ker
 Forest Research
 Northern Research Station
 EH25 9SY Roslin, Midlothian
United Kingdom
 Tel: (44-131) 4456912
 Fax: (44-131) 4455124
 Email: esther. forestry.gsi.gov.uk

Steve Lee
 Forest Research
 Northern Research Station
 EH25 9SY Roslin, Midlothian
United Kingdom
 Tel: (44-131) 4456926
 Fax: (44-131) 4455124
 Email: steve. forestry.gsi.gov.uk

Rob Sykes
 Forest Research
 Northern Research Station
 EH25 9SY Roslin, Midlothian
United Kingdom
 Tel: (44-131) 4456927
 Fax: (44-131) 4455124
 Email: rob. forestry.gsi.gov.uk

EUFORGEN Secretariat

Jarkko Koskela
 EUFORGEN Coordinator
 Regional Office for Europe
 Bioversity International
 Via dei Tre Denari 472/a
 00057 Maccaresse (Fiumicino)
 Italy
 Tel: (39) 06 6118223
 Fax: (39) 06 61979661
 Email: j. cgiar.org

Unable to attend

Lennart Ackzell
 National Board of Forestry
 Skogstyrelsen
 Vallgatan 8
 55183 Jönköping
Sweden
 Tel: (46-36) 155706
 Fax: (46-36) 166170
 Email: lennart. svo.se