Convention on Long-Range Transboundary Air Pollution
International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests

Results of the International Cross-Comparison Courses 2005

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July 2006

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Federal Research Centre for Forestry and Forest Products

Contents

1 Introduction

The concept of International Cross Comparison Courses (ICCs) was introduced by the Expert Panel (EP) on Crown Condition Assessment in cooperation with the Programme Coordinating Centre (PCC) of ICP Forests in order to document the temporal consistency of the crown condition assessments all over Europe or at least the consistency of the ICC participants, the National Reference Teams (NRTs). The ICCs replaced the former training courses which aimed at improving the comparability of the crown condition assessments by focussing on the homogeneous interpretation of the ICP Forests manual. The work and discussions during these training courses led to a number of improvements and clarifications of the manual. As it seemed not to be feasible to improve further the homogeneity of assessments in a more and more detailed way the annual training courses were replaced by the ICCs in order to ensure the temporal consistency of the existing time series on crown condition assessments all over Europe (Level I).

In 2002/2003 the Working Group on Biotic Damage Assessment within the Expert Panel on crown condition elaborated a manual on damage assessment in order to define a European wide homogeneous way of assessing and documenting abiotic and biotic damage on trees. In order to ensure the homogeneous interpretation and to improve the amended manual if required, a session on the damage assessment was implemented during the 2005 ICCs which were held in Finland, the Czech Republic and France on different tree species.

2 Statistics

In general, the evaluation of the 2005 ICCs focussed on the same issues as the evaluation of the ICCs in 2002 and 2001 (MUES & SEIDLING 2002) and in 2003 (MUES 2003). The correlation between the assessments of two paired teams was calculated as Spearman rank correlation (PROC CORR, SAS 1999). The SAS procedure CORR computes the Spearman's correlation by ranking the data and using the ranks in the Pearson product-moment correlation formula. In case of ties, the averaged ranks are used. Significant correlations are printed bold in this report.

The difference between the assessments of two paired teams was evaluated as relative frequency (PROC FREQ, SAS 1999) of those absolute differences which were lower than 5%, 10%, or 20%, respectively. The null hypothesis that there is no difference in location for defoliation among the assessments of the teams was tested using the Kruskal-Wallis test (PROC NPAR1WAY, SAS 1999).

3 Assessment of Norway spruce, Scots pine and Birch in Helsinki, Finland, 3 – 6 September 2005

3.1 Organisation

The Nordic ICC 2005 was held in Helsinki/Finland from 3 to 6 September. A list of participants is presented in Annex 1. The opening was a registration and an introduction into the schedule at evening of September 3 in the congress centre "Gustavelund" at Lake Tuusula, 20 km North of Helsinki. In the following two days the field work was carried out. During the morning session of the last day the first results of the field work, the assessment of damage according to the ICP Forests manual (version of autumn 2004), and the outcome of the Photo Exercise 2004 were discussed.

A photo session was not held during the ICC but photo sets were prepared for assessment by the host country and distributed to the ICC participants. The photos were taken either during the course or in the last days before the ICC.

3.2 Field work

On 8 plots (3 on Norway spruce, 3 on Scots pine and 2 on Birch) defoliation was assessed in 5% steps on each plot from a marked, fixed position and afterwards following the national method as far it deviated from the fixed position method. On all but the birch plots also discolouration was assessed following the coding in the ICP Forests manual. The birch plots already started being affected by the autumn colouring. On one Norway spruce plot and one Scots pine plot also damage assessments were made. On each of the two plots 7 trees were selected by the host country and marked with red bands. The participants did not know which of those 7 trees showed damage. According to the manual, the location of damage, symptom, cause and extent were recorded and coded by the participants as far as damage was observed.

3.3 Results of defoliation assessments

In general, the defoliation assessments made from a fixed position were evaluated. In case of the plots 1504 and 1505 no fixed positions had been prepared and the national methods were used to find adequate positions due to high stand density. First descriptive statistics of the defoliation assessments are presented in Table 1.

Table 1: Descriptive statistics of the defoliation assessments of the ICC in Finland.

species	plot	n	mean	median	std dev.	min	max
all	all	2400	18.6	15.0	10.7	0	75
birch	99_1503	300	15.7	15.0	7.4	0	45
birch	99_1508	300	17.8	15.0	8.9	0	50
spruce	99_1502	300	22.9	20.0	11.0	0	65
spruce	99_1504	300	13.6	15.0	8.1	0	45
spruce	99_1507	300	22.3	20.0	9.9	0	60
pine	99_1501	300	22.2	20.0	15.0	5	75
pine	99_1505	300	18.5	15.0	11.0	0	75
pine	99_1506	300	16.0	15.0	7.9	0	40

3.3.1 Norway spruce

In order to describe the plot specific **distribution** of the assessments minimum, maximum, mean, median, and standard deviation were used to produce graphics (Annex 2). The ranking of the teams is not consistent. The assessments of team 12 are relatively high on all plots but other teams show relatively high values on some plots (e.g. team 10 on plot 99_1502 and plot 99_1507) and relatively low values at another (team 10 on plot 99_1504). In addition, the teams mostly had the same ranking of the plot levels of defoliation as described by mean and median values in Table 1.

The **differences** between the assessments of two participants can easily be calculated. The frequency of absolute differences lower or equal 5%, 10% and 20% are presented in Annex 3. The interpretation of the tables is demonstrated by the pair team02 with team12: 43% of all Norway spruce trees which were assessed by both teams had absolute differences lower or equal 5%, 57% are lower or equal 10% and for 92% of the trees absolute difference lower or equal 20% were found. In Annex 3 percentages below a specific level which is indicated at the upper left of each of the three tables are written bold and red to facilitate the finding of pairs which show more frequently stronger deviations. The tables show that assessments of the team02 deviate relatively strong from the assessments of the team12.

For many pairs significant differences of the level of defoliation were found by the Kruskal-Wallis test (Annex 4). The results show that the assessments of the Estonian team on the whole crown was significantly different to almost all other teams. Thus, it seems that most teams assessed the upper part of the crown.

The SPEARMAN **correlation** coefficient describes the coherency of the assessments of two teams with respect to their ranking. The correlation coefficients for the Norway spruce assessments are presented in Annex 5. The values are between 0.38 (teams from Norway and Russia) and 0.88 (team from Finland with teams from Norway and Sweden). All correlation coefficients are significant at a significance level of 5%. Also most correlation coefficients which are calculated plot specific (not figured) are statistically significant. Only some correlation coefficients of the assessments of the Czech and of the Russian team are not statistically significant for plot 99_1504 but also positive.

3.3.2 Scots pine

The plot specific **distribution** of the assessments (minimum, maximum, mean, median, and standard deviation) is presented in Annex 6. The ranking of the teams is relatively consistent. The assessments of teams 2, 11, and 12 are relatively high on all plots whereas other teams (3 and 9) show relatively low values on all 3 plots. In addition, the teams had mostly the same ranking of the plot levels of defoliation as described by mean and median values in Table 1 on page 7.

The frequency of absolute **differences** lower or equal 5%, 10% and 20% are presented in Annex 7. The tables show that assessments of all teams do not differ too much from each other. Only the absolute differences between the assessments of team 3 and team 7 on one hand and of team 10 and team 11 on the other led to higher values.

For many pairs significant differences of the level of defoliation were found by the Kruskal-Wallis test (Annex 8). Two groups of teams can be identified which are without significant differences: The first group is set up by the teams from the Czech Republic, Denmark, Finland, Germany, Latvia, Lithuania, Norway Level I, Norway Level II and Estonia (entire crown assessment), the second group by Estonia (upper third), Russia and Sweden which are not significantly different.

The SPEARMAN **correlation** coefficients are presented in Annex 9. The ranking for the Scots pine assessments are between 0.42 (teams from Lithuania and Norway Level I) and 0.87 (team from Germany with teams from Latvia and Lithuania). All correlation coefficients are significant at a significance level of 5%. Also most correlation coefficients which are calculated plot specific (not figured) are statistically significant. Only some correlation coefficients of the assessments on plot 99_1501 and on plot 99_1506 are not statistically significant.

3.3.3 Silver birch

Only two plots were assessed for silver birch. The plot specific **distribution** of the assessments (minimum, maximum, mean, median, and standard deviation) is presented in Annex 10. According to these distributions the ranking of the teams in most cases is consistent but team 2, team 10 and team 12 show relatively higher assessments on plot 99_1508 compared to plot 99_1503. Also the plot specific values in Table 1 indicate that at least some trees on plot 99_1508 were assessed with higher defoliation scores at least by some teams.

The pair wise absolute **differences** were calculated also for Silver birch and the frequency of these differences within the limits of 5%, 10% and 20% are presented in Annex 11. The tables show that assessments of the team 2 and team 9 deviate relatively strong from the assessments of some other teams but almost all assessments were within the 10% limit.

In Annex 12 the results of the pair wise significant differences of the level of defoliation are presented. There is no clear grouping between the teams related to the level of assessed defoliation found but it is obvious that the assessments from the teams 1, 2, 3, 4, 5, 7, 10, 11, and 12 (Czech Rep., Denmark, Estonia upper third, Germany, Sweden, Norway Level II, and Estonia whole crown) are not significantly different. Also the assessment of the Lithuanian team is relatively close to this group of teams.

The ranking of the trees by the various teams is described by the SPEARMAN **correlation** coefficient and is presented for Silver birch in Annex 13. All correlation coefficients are significant at a significance level of 5%. Also most correlation coefficients which are calculated plot specific (not figured) are statistically significant. Only for plot 99_1508 4 pairs were found with positive but not significant correlations: Estonia upper third and Norway Level II, and Finland with Latvia, Norway Level I and Norway Level II.

3.4 Results of photo exercise

The photo sets were prepared after the ICCs based on photos which were made during the ICC or the week before it. The photo sets were prepared with the following numbers:

Table 2: ICC Finland: number of photos in sets.

species	99_1501	99_1502	99_1503	99_1504	99_1505	99_1506	99_1507	99_1508
birch			4					16
spruce		5		1			14	
pine	5				5	10		

Thus, all sets consisted of 20 photographs. Due to poor photo quality or difficulties with the background of the photos, not all photographs were assessed by all participants. The numbers and simple statistics of assessments are presented in Table 3 for the photos which were assessed by all 11 teams (16 photos for birch, 18 for spruce and 20 for pine):

Table 3: ICC Finland: statistics of photo assessments.

species	n	mean	median	std dev.	min	max
all	594	22.5	20	14.0	0	75
Birch	176	16.7	15	8.7	0	45
Spruce	198	27.2	25	13.5	0	70
Pine	220	22.9	20	16.5	5	75

The evaluation was carried out by frequency distributions of absolute differences of photo and field values and Spearman correlation coefficients between photo and field values. The main results are:

- 87.9 percent of all differences are within +-10 % points.
- For birch this value is 92.0, for spruce 86.9 and for pine 85.5 percent.
- For some teams even 100 percent of all absolute differences are in this range.
- Almost all correlation coefficients are significant at 5% significance level. Only for two teams on birch and for one team on pine the correlation coefficient is not significant.

3.5 Damage assessments

For the damage assessment a number of trees was selected in two of the eight plots: plot 99_1501 number 1, 3, 14, 20, 22, 23, and 25 for Scots pine, plot 99_1502

number 2, 5, 11, 13, 15, 20, and 23 for Norway spruce. This damage assessment exercise was performed in order to identify possible problems in the field work according to the ICP Forests manual on Crown Condition Assessment (part II) and to ensure that the interpretation and application of the manual is conducted in the participating countries in the same way. The assessments (not figured) showed that the affected part of the tree and the symptom could be assessed rather homogeneously by the participants, but there were differences in the assessment of cause and extent of the damage. Also the question was discussed what damage type should be assessed.

The results of the field assessments were discussed during the final meeting of the ICC and the outcome of this discussion e.g. some need for manual amendments are reported in the section on this discussion below.

3.5.1 Comparison with field assessments made during the ICC in 2001

To be amended.

3.6 Final discussion

The discussion at the end of the ICC focussed on the main scopes of the programme, the assessment of defoliation and discolouration and of damage types. A short discussion on the outcome of the Photo Exercise 2004 followed.

3.6.1 Field work in general and defoliation assessments

The organizers of the ICC 2005, the host country and PCC of ICP Forests thanked the participants for the work they did during the field work as in contrast to former ICCs 8 plots instead of usually 6 were assessed. All participants agreed on the decision of the host country to implement two additional plots on birch and underlined the importance of this tree species for the Nordic countries.

A routine had been developed for arranging ICCs during the last years which was welcomed by all participants. Proposals will be made by the host country and PCC for improvements e.g. of the information to be given with the first announcement or before the next ICCs.

It was stated that clearly defined and firmly fixed position should be used for the defoliation assessment. In case that a participant considers the diverging assessment results as being caused by national method, an independent (second) assessment can be made.

An additional day would be needed if further parameters (e.g. an intensified exercise on biotic damage assessment) are to be integrated in the ICC. The ICC should be organised before September in order to avoid a possible autumn colouring of the leaves.

3.6.2 Damage assessments

It was expressed by the participants that some clarifications in the manual could contribute to a more homogeneous interpretation which damage types have to be assessed and documented by the field teams and which ones do not need to be assessed. The major question is which damages are relevant. The participation of Seppo Nevalainen, member of the Working Group on Biotic Damage Assessment, during the entire course and especially during the final discussion was found to be very helpful as many questions could be solved.

All needs for clarifications or amendments in the respective section of the ICP Forests manual were presented to the Expert Panel on Crown Condition Assessment and led to an update of the manual which was approved by the Task Force of the ICP Forests in May 2006 in Tallinn, Estonia.

As member of the Working Group on Biotic Damage Assessment within the Expert Panel on Crown Condition Assessment of ICP Forests, Mr. Seppo Nevalainen was involved in the development of the respective manual section. Therefore, he was able to give some clarifications on details which are listed in short below:

- The assessment of the symptoms is made on the whole crown, but the quantification is referred only to the assessable crown!
- Several injuries can be recorded for a tree (the data submission was not clear to all NFCs but was improved with manual update in summer 2006)
- Several symptoms are not recorded for the same causal agent (only the most important symptom)
- If the damage cause is not identified, symptoms & extent should be reported
- Sometimes it is not easy to record only the most important symptom of the same agent; often the agent cannot be clearly detected by the field team, some symptoms and damaging agents can only be identified by a specialist.
- Some agents are not easy to detect for field groups: e.g. stem rot (*Heterobasidium*); the principle should be: document only what you see and not what you expect.

Further points of discussion have been:

- Is defoliation a precondition to document a damage value?
- Competition is normally not seen as damage, why to record this damage?
- A limit should be set (e.g. 10% for unknown causes, 5% for known reasons?; must be not for stem); Seppo: record a damage if information in the database is increasing by doing this; Soren: Accuracy (no team effect) and information increase are only observed if lower limit for damage is set; additionally the damage assessment for slight defoliation would cost too much money
- It should be recorded if a damage is an old or a new one; how long should a damage be recorded as damage (introduced with manual update summer 2006)
- Need for very clear manual at this early stage; probably only some minor clarifications would be enough to get a more homogenous interpretation; the reality is probably better than made by the discussion
- Dead branches on spruce can be of unknown cause

The participants thanked Peter Roskams and the working group on Biotic Damage Assessment for the work done so far; biotic damage assessment is found to be important information for the programme.

3.6.3 Photo Exercise 2004

PCC of ICP Forests organized a photo exercise in 2004. The organization, the wide participation and the outcome of this exercise was welcomed by the participants of the ICC. Nevertheless, some photos of the applied photo sets will have to be replaced by others of better quality in order to improve the comparability of the assessments.

It was suggested to re-assess the photo sets every 4 years in order to avoid that participants remember the assessments they made during the last year. In addition, it was proposed to mirror the photos for the same reason.

It was proposed to organize the next Photo Exercise in the early summer as most field teams could be reached then during training courses and the group of participants could be completed.

4 Assessment of Norway spruce and Beech in Nove Mesto na Morave, Czech Rep., 10 – 13 September 2005

4.1 Organisation

The Central European ICC 2005 was held in Nove Mesto na Morave/Czech Republic from September 10 to 13. The assessment was conducted on 6 plots, 3 on Norway spruce and 3 on beech. An exercise on damage assessment was included during the field work on a selected number of trees on two plots (beech and spruce) as well as a photo session. A list of the participants is presented in Annex 14.

During the morning session of the last day the first results of the field work, the assessment of damage according to the ICP Forests manual (version of autumn 2004), and the outcome of the Photo Exercise 2004 were discussed as well as a first evaluation of a photo exercise which was done by the participants of the ICC during the last evening of the course.

4.2 Field work

On 6 plots (3 on Norway spruce, 3 on beech) defoliation was assessed according to the ICP Forests manual. Where possible, the assessments were made from a marked, fixed position and afterwards following the national method as far it deviated from the fixed position method (plots 99_5801 and 99_5806). On the other plots the participants were asked to use a position according to the method usually applied in their countries due to high stand density. All those plots were regular Level I plots.

12 teams participated in the course from which only two (DEN and SWE) made assessments from positions chosen according to national methods in addition to the proposed positions on plots 99_5801 and 99_5806.

On all plots also discolouration was assessed following the coding in the ICP Forests manual.

4.3 Results of defoliation assessments

On each of the six plots of the ICC test range in the Czech Republic 25 trees were selected for the defoliation assessment. 2 trees on plot 99_5806 were thrown by wind a few days before the course and could not be assessed. Due to high stand density and competition some of the trees were not assessed by all participants and led to very inhomogeneous assessments by the other teams. Those trees were excluded from the evaluation as according to the ICP Forests manual no suppressed trees should be selected for the assessment of defoliation. In addition team 3 (Germany 2) refused to assess the trees on plot 99_5803 and it must be stated that the

assessments of GER2 must be interpreted with care as this participant is rather an untrained person.

Table 4: Suppressed/fallen trees excluded from the evaluation.

Plot	tree#
99_5803	23
99_5803	30
99_5805	13
99_5805	16
99_5805	19
99_5805	23
99_5806	19
99_5806	20

The means and other statistics of the defoliation assessments are presented for all plots in Table 5.

Table 5: Descriptive statistics of the defoliation assessments during the ICC in Czech Republic

Spec	plot	n	mean	median	std dev.	min	max
all	all	1869	32.9	25	22.1	0	95
Beech	99_5802	324	27.3	25	11.8	5	65
Beech	99_5804	325	31.5	25	17.7	5	90
Beech	99_5806	322	38.4	35	21.3	5	95
Spruce	99_5801	350	60.2	60	19.7	15	95
Spruce	99_5803	276	14.9	15	9.5	0	40
Spruce	99_5805	272	18.2	20	10.1	0	45

The plot specific statistics show that for beech on almost all plots a wide range of defoliation scores was assessed. Also for Norway spruce at least on plot 99_5801 some trees were assessed with relatively high defoliation scores. Anyhow, this plot was introduced in the test range as the plot with the highest altitude in the Moravian mountains. Very specific damage was observed on the trees on this plot and most participants indicated that they were not used to assess trees which were affected by snow break, deposition effects and heavy winds. The density on the two other Norway spruce plots (99_5803 and 99_5805) was high.

4.3.1 Norway spruce

The plot specific **distribution** of the assessments (minimum, maximum, mean, median, and standard deviation) is presented in Annex 15. The ranking of the teams is not always consistent. The assessments of team 5 are relatively high on all plots and those of team 11 are relatively low. On the other hand the teams show relatively high defoliation values on plot 99_5801 (e.g. teams 8 and 12) and relatively low values on the other plots. This inconsistency can at least partly be due to the very special situation on plot 99_5801 (see above). Anyhow, the variation between the defoliation scores of the teams seems to be higher than with the Finnish ICC described above.

The pair specific **differences** between the teams are presented in Annex 16. As already indicated by the team specific statistics in Annex 15 relatively high pair-wise absolute differences were found. This can be explained by the high density at two of the assessed stands which causes a higher variation of the assessments due to more difficult and probably different ways to find a proper place from where to assess the defoliation. As the third stand (99_5801) was relatively special (see above) also there the absolute differences showed no higher homogeneity of the defoliation scores (not figured).

Significant differences of the level of defoliation were found for many pairs by the Kruskal-Wallis test (Annex 17). The level of scores of the Swedish team made from a location deviating from the proposed tree specific fixed position (selection of the location from where to assess following the Swedish nationally applied method, SWE_nat) is significantly different from all other assessments. These assessments were made in addition to the assessments from the fixed positions prepared for plot 99_5801. As the Swedish team made a second assessment only on plot 99_5801 (and for the other two Norway spruce plots no fixed positions were used) this result is based on the assessment of only 25 trees.

The correlation coefficients for the Norway spruce assessments are presented in Annex 18. All correlation coefficients are significant at a significance level of 5% but this is not confirmed by the plot specific analyses (not figured). Especially on the two plots with higher density (plot 99_5803 and plot 99_5805) more than half of all pairs made assessments which are not significantly correlated. This result underlines the difficulties to assess tree defoliation in stands of high density. All correlations which were calculated for plot 99_5801 are significantly correlated (not figured). This is maybe also due to the higher range of the assessed defoliation scores but it indicates as well that the same trees were assessed with relatively high (or low) defoliation scores by all teams.

4.3.2 Beech

The distributions of the team assessments for beech are presented in Annex 19. On plot 99_5806 the team from Denmark made for some trees alternative assessments deviating from the proposed fixed position from which the assessments of the other teams were made. In general, a very wide range of defoliation scores was assessed by the participants. The ranking according to the mean defoliation level, calculated for each team, was relatively consistent over the 3 plots. E.g. the teams from Flanders and Sweden (6 and 8) made defoliation assessments at a relatively low level on each plot whereas the teams from the UK, Austria and Romania assessed on a relatively high level. Team Germany2 (untrained person) assessed on plot 99_5802 a defoliation level which is common with most other teams but on plot 99_5806 and on plot 99_5804 with the highest mean and median values although other teams assessed higher defoliation scores for single trees.

In Annex 20 the frequencies for absolute pair-wise deviations between the defoliation scores are presented. It is obvious that the assessments from team GER2 were deviating frequently from the assessments of other teams but also the relatively high assessments made by the teams from UK and Flanders deviated relatively strongly from those of other participants.

Significant differences of the level of defoliation were found for many pairs (Annex 21) but e.g. the level of assessments made by the teams from the Slovak Rep., Italy,

Finland, Hungary and Austria are not significantly different. Another group is built by the teams from Flanders, Sweden and Denmark.

All correlation coefficients between the participating teams (Annex 22) are statistically significant and indicate that the ranking of the tree scores is very homogeneous. The plot specific evaluation (not figured) showed that some correlations calculated with GER2 (plot 99_5802) and with UK (plot 99_5804), respectively, are not statistically significant. This should not be over-interpreted as GER2 is untrained and the team from UK stated that the participants are not used to assessing defoliation in comparable beech forests.

4.4 Results of the photo exercise

The photo sets were prepared before the ICCs. For beech assessments of 23 and for spruce of 25 photographs could be evaluated. The numbers of assessments and simple statistics of assessments based on evaluation of 13 teams are presented in Table 6.

Table 6: ICC Finland: statistics of photo assessments.

species	n	mean	median	std dev.	min	max
all	624	44.4	40	21.9	0	95
beech	299	35.1	30	19.9	5	95
spruce	325	53.1	50	20.1	0	50

Frequency distributions of absolute differences and Spearman correlation coefficients between photo and field values are calculated. The main results are:

- 78.7 percent of all differences lie within +-10 % points.
- For beech this value is 81.9 and for spruce 75.7 percent points.
- Only one team assessed all spruce photos within a limit of +-10% difference as related to the field values. All other teams had lower values in spruce and beech.
- All correlation coefficients are significant at a level of 0.05.

The higher differences and the significance of the correlation coefficients compared with the results from the photo exercise of the Finnish ICC are probably due to the higher range of defoliation scores. But also the quality of the photos could be a possible reason. Much more important in the sense of the aims of the ICCs is the documentation of the temporal consistency which will be possible after a repetition of the exercise.

4.5 Results of damage assessments

A damage exercise was carried out on a number of selected trees on plot 99_5801 (Norway spruce) and on plot 99_5806 (beech).

4.6 Final discussion

All participants thanked the host country and the organizing colleagues from the Czech Republic for the perfect organization of the ICC. After a short presentation of first results it was underlined that the Norway spruce stands and especially plot 99_5801 were very special and not comparable to a normal stand in the home countries of most participants. For the ICCs in the future, the proposal was made to focus more on less dense stands. On the other hand it was pointed out that in addition to stands of lower density also such of high density should be assessed for defoliation in order to get an impression to which degree the comparability of defoliation assessments is reduced by a poor visibility of the tree crown.

The results of the Photo Exercise 2004 were presented and a short discussion showed that the participants were satisfied with the results. Some participants had the feeling that the range of given defoliation scores could be somehow too high for some photos, other stated that compared to field exercise the results showed a wider distribution of scores but with respect to the general problems with the assessment of defoliation from photos the results were quite acceptable. A planned repetition of the exercise in 2008 was welcomed.

For a reliable damage assessment three principles were considered as essential following the discussion in the Czech Republic and the explanations of Seppo Nevalainen during the preceding ICC in Finland:

1.) Symptom: Assess only what you see, not what you expect to be there.

2.) Cause: Record only what you know.

3.) Relevance: Record only what enhances the information stored in the database.

Alternative: Record only damage types which are *relevant* for the damage *now or in future*.

The definition of relevance must be clearly defined in the manual. In addition, examples of damage types which are and those which are not relevant could be amended. If three leaves are devoured, it would be of no importance and a limit, probably of 10% defoliation for known and 20% defoliation for unknown reasons could allow the observers to be much faster and would help to avoid the implementation of country of team specific levels of relevance.

The cause “fallen due to other fallen tree” (probably due to wind or harvesting activities of man) is not given. The question was made how to code these causes (e.g. storm damage) especially if the reason for the falling of the first tree cannot be clearly seen.

5 Assessment of Maritime pine and Holm oak in Carcans, France, 18 – 21 September 2005

5.1 Organisation

The Mediterranean ICC 2005 was held in Carcans/France from September 18 to 21. A list of the participants is given in Annex 23. This course had to be organized in a very short time as the originally planned course could not be held due to organizational and financial problems. Nevertheless, the organizers in France ensured a very valuable ICC on the two main tree species in the Mediterranean region, Maritime pine and Holm oak. Probably due to the limited time for the invitation less crown condition experts participated in the course than in other years.

5.2 Field work

On 6 plots (3 on Maritime pine and 3 on Holm oak) defoliation was assessed following the national method as far as it deviated from the fixed position method. 7 teams participated in the Mediterranean ICC 2005 in France. The results of two teams (ICP and WGE) have to be interpreted as results of untrained persons.

According to the manual location of damage, symptom, cause and extent were recorded and coded by the participants as far as damage was observed.

5.3 Results of defoliation assessments

On all 6 plots 20 trees were assessed by 5 teams for defoliation. Table 7 presents these 100 observations of defoliation per plot.

Table 7: Descriptive statistics of the defoliation assessments during the ICC in France

species	plot	n	mean	median	std dev.	min	Max
all	all	840	26.4	25.0	13.7	0	75
M. pine	99_0103	140	23.5	20.0	11.4	5	70
M. pine	99_0105	140	18.9	20.0	7.8	0	40
M. pine	99_0106	140	27.1	25.0	12.2	5	70
Holm oak	99_0101	140	30.6	25.0	16.3	5	75
Holm oak	99_0102	140	25.9	25.0	14.0	5	70
Holm oak	99_0104	140	32.6	30.0	14.5	5	70

For both tree species a range of 70 percent points in defoliation was assessed by the participants. Nevertheless, the integrated interpretation with mean and standard deviation leads to the conclusion that most trees were assessed with lower defoliation scores and only single trees with higher scores which is typical for most ICC stands.

5.3.1 Maritime pine

The plot specific distribution of the team assessments is presented in Annex 24. The ranking of the teams is not very consistent as e.g. on plot 99_0103 team 1 (FR1) scored the lowest and team 5 (P) the highest defoliation but on plot 99_0106 it is the opposite. In addition, the range of the team values is sometimes high and on other plots relatively low compared with the assessments of other teams.

The pair specific differences between the teams are presented in Annex 25. As already indicated by the team specific statistics in Annex 24 relatively high pair-wise absolute differences were found. E.g. only 85% of all absolute differences between team 1 and 5 are within a limit of 20% points.

Significant differences of the level of defoliation (Annex 26) were found between the French teams on one hand and the teams from Italy and Portugal. Other significant differences were found for the level of defoliation assessments from the untrained teams from ICP and WGE.

The correlation coefficients for the Maritime pine are presented in Annex 27. All correlation coefficients but those between FR1 and P and between ICP and WGE are significant at a significance level of 5%. Especially the correlation coefficients for plot 99_0103 are not all significant (plot specific results are not figured).

As a general outcome for Maritime pine it can be stated that apparently the selected trees were not easily assessable or at least the assessments vary, and it will be of high interest whether this observation will be confirmed by the assessments made during a repetition of the exercise.

5.3.2 Holm oak

For Holm oak the plot specific distribution of the team assessments is presented in Annex 28. The ranking of the teams is much more consistent than found for Maritime pine (section 5.3.1). Only team 4 made relatively high assessments on plot 99_0104 whereas the mean and median calculated for team 4 on plot 99_0101 and 99_0102 are relatively low. The differences between the defoliation levels are generally higher on plots 99_0101 and 99_0104 whereas the mean level of defoliation scores was relatively homogeneous on plot 99_0102.

The pair specific absolute differences between the team assessments are presented in Annex 29. They show that the assessments of team FR2 and especially those of team FR1 are relatively frequently different from the assessments of the other teams. Accordingly, significant differences of the level of defoliation (Annex 30) were found between the French and the other teams.

The correlation coefficients for Holm oak are presented in Annex 31. All correlation coefficients are significant at a significance level of 0.05%. The plot specific results (not figured) confirm this. Only some pairs (mostly with participation of P) are not significantly correlated. Thus, in general, the defoliation assessments were of different levels but in most cases the ranking of the assessed trees was very homogeneous among the participating teams.

The discussion at the end of the ICC focussed on the main two points of the programme, the field assessments and the damage assessments. A short discussion on the outcome of the Photo Exercise 2004 followed.

5.4 Final discussion

According to the discussions on the other ICCs, the participants of the Mediterranean ICC expressed their gratitude to the host country and the organizing staff. On the other hand it was underlined by the organizers that the participants conscientiously assessed all trees at the test range in Carcans.

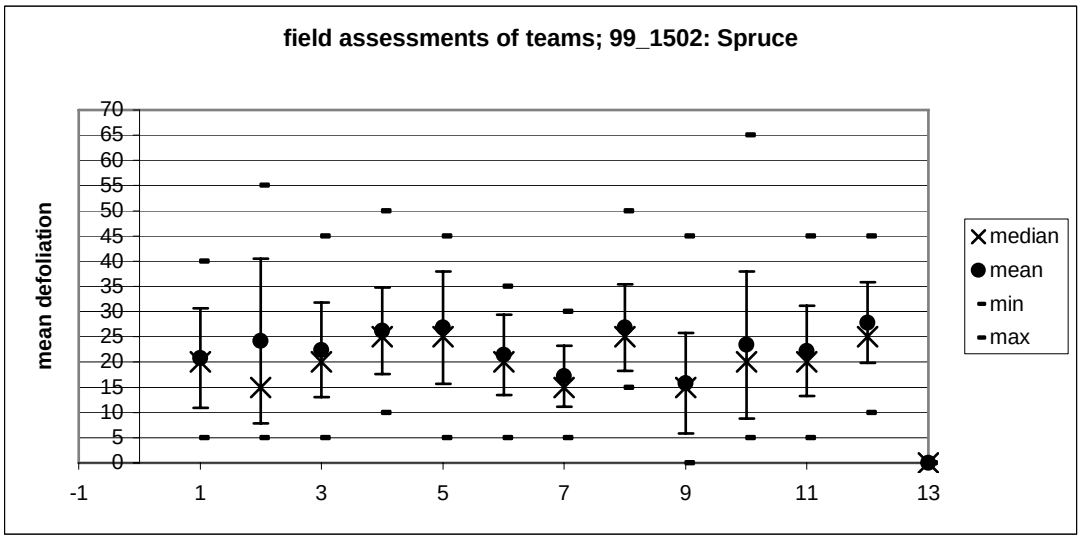
The results of the photo exercise 2004 were welcomed by the participants. The damage assessments of the ICC in Carcans revealed problems which were similar to those of other ICCs, and the need for amendments was supported by the experts.

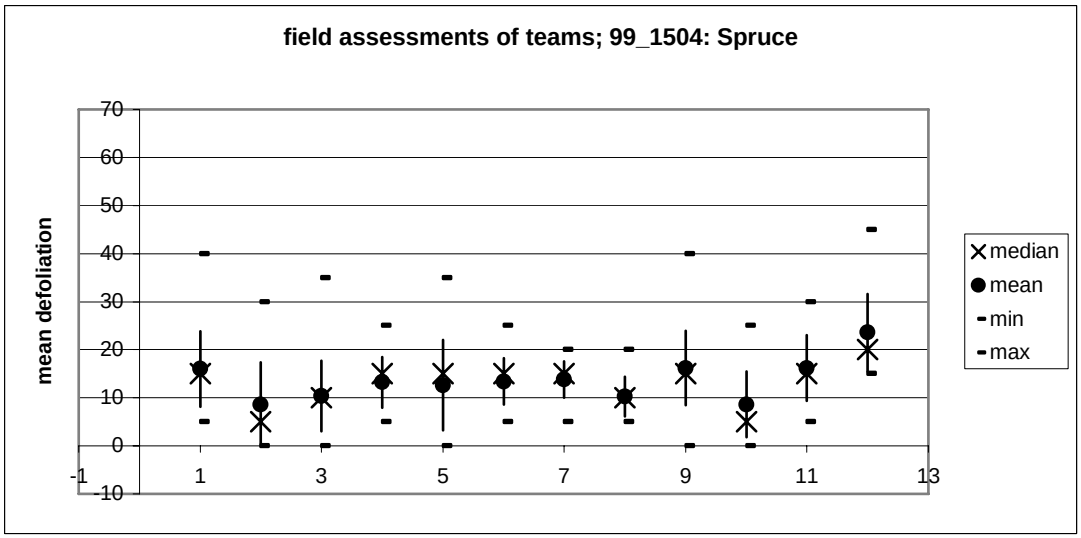
6 ANNEXES

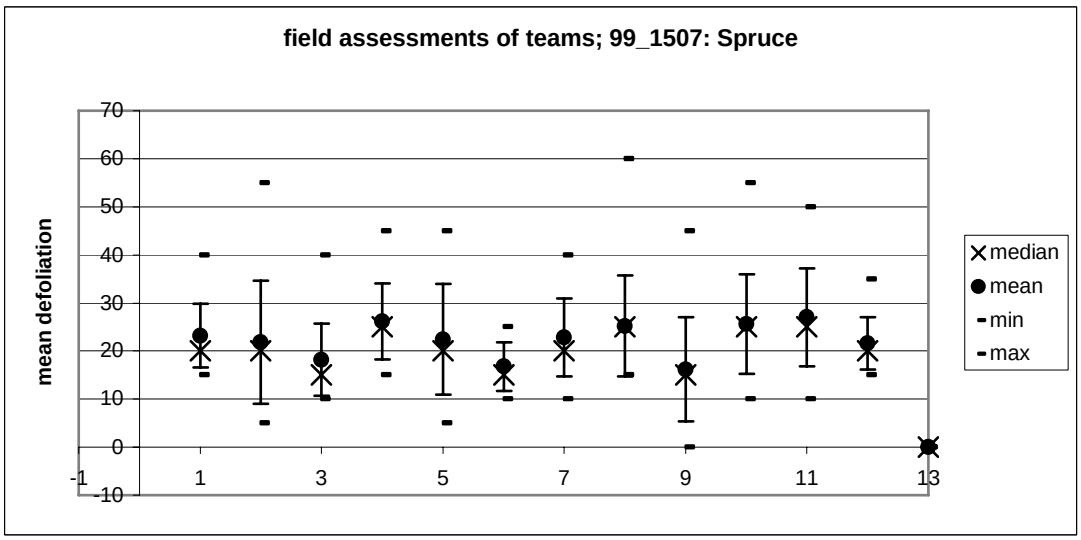
Annex 1: Participants and field teams of the ICC in Finland.

		first name	family name	team	#	Institute
1	Mr.	Martti	Lindgren	organization		Finnish Forest Research Institute
2	Mr.	Antti	Pouttu	organization		Finnish Forest Research Institute
3	Mr.	Seppo	Nevalainen	organization		Finnish Forest Research Institute
4	Mr.	Hannu	Rantanen	organization		Finnish Forest Research Institute
5	Mr.	Volker	Mues	organization		Federal Research Centre for Forestry and Forest Products
6	Mr.	Peter	Kapitola	CHZ	1	Forestry and Game Management Research Institute Jiloviste-Strnady
7	Ms.	Ludmila	Bohacova	CHZ	1	Forestry and Game Management Research Institute Jiloviste-Strnady
8	Mr.	Mogens	Egebjerg Pedersen	DK	2	Forest & Landscape Denmark
9	Mr.	Heino	Ounap	EST1_3, EST_whole	3, 12	Centre of Forest Protection and Silviculture
10	Mr.	Enn	Kaljula	EST1_3, EST_whole	3, 12	Centre of Forest Protection and Silviculture
11	Mr.	Kimmo	Siuruainen	FIN	4	Finnish Forest Research Institute
12	Mr.	Hannu	Autio	FIN	4	Finnish Forest Research Institute
13	Mr.	Mario	Helbig	GER	5	Landesforstpräsidium Sachsen
14	Ms.	Ieva	Zadeika	LAT	6	State Forest Service
15	Mr.	Indulis	Vanags	LAT	6	Balvi Headforestry
16	Mr.	Ricardas	Beniusis	LIT	7	Lithuanian State Forest Survey Service
17	Mr.	Knut Ole	Viken	NOR_L1	8	NIJOS
18	Mr.	Rune	Eriksen	NOR_L1	8	NIJOS
19	Ms.	Natalia	Goltsova	RUS	9	Biological Research Institute of Sankt-Petersburg State University
20	Mr.	Boris	Popvichev	RUS	9	Biological research Institute of Sankt-Petersburg State University
21	Mr.	Sören	Wulff	SWE	10	SLU, Dept. of Forest Resource Management and Geomatics
22	Mr.	Volkmar	Timmermann	NOR_L2	11	Norwegian Forest Research Institute

Annex 2: ICC Finland, distribution of assessments for Norway spruce.







Annex 3: ICC Finland, frequency of absolute differences lower or equal 5%, 10%, and 20% for Norway spruce.

40											
absdif +/-5	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	60										
3	67	63									
4	72	55	67								
5	56	63	67	69							
6	81	59	84	68	61						
7	72	61	72	75	56	76					
8	60	57	69	89	60	69	71				
9	56	52	61	47	47	65	69	45			
10	71	75	73	76	67	68	68	73	51		
11	75	48	59	77	57	68	77	64	47	68	
12	60	43	61	67	51	53	48	55	41	45	60

60											
absdif +/-10	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	77										
3	93	89									
4	93	76	89								
5	85	84	87	92							
6	96	88	96	89	87						
7	91	80	92	93	81	96					
8	85	84	88	97	89	85	87				
9	81	76	83	75	73	89	85	71			
10	84	87	85	91	84	87	92	91	76		
11	92	77	83	96	81	88	96	92	81	87	
12	84	**57**	83	89	76	87	81	83	73	72	85

90											
absdif +/-20	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	99										
3	100	99									
4	99	100	100								
5	99	99	100	100							
6	100	96	100	100	99						
7	100	93	100	99	99	100					
8	97	96	100	100	99	99	99				
9	97	93	100	96	93	99	97	97			
10	95	100	96	100	100	96	97	100	95		
11	99	97	99	100	100	97	100	100	97	97	
12	99	92	97	96	99	99	99	93	99	95	100

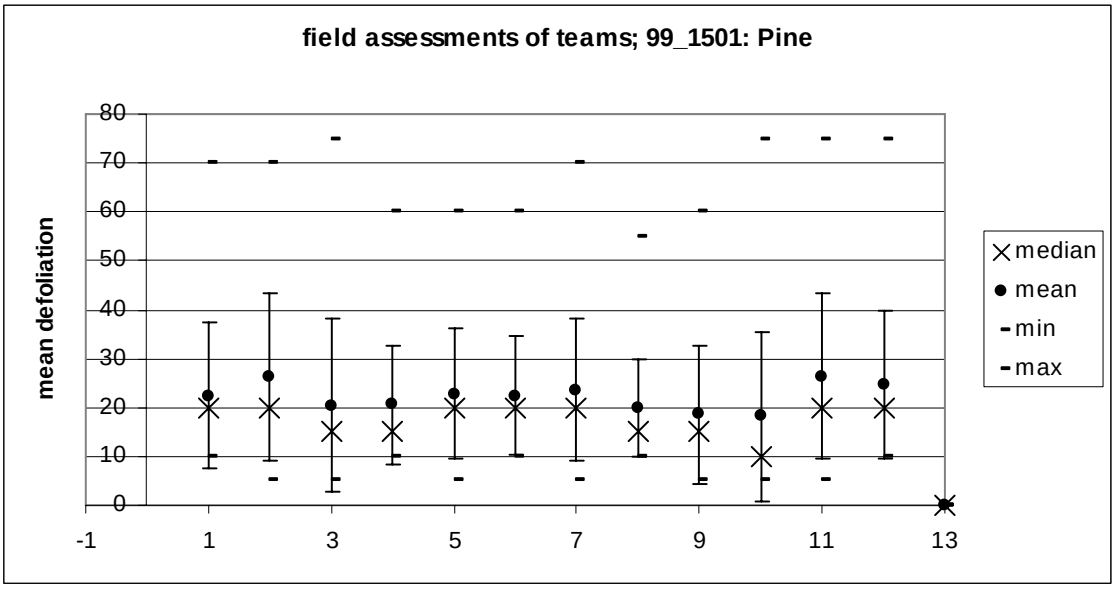
Annex 4: Finland, Kruskal-Wallis test for Norway spruce: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

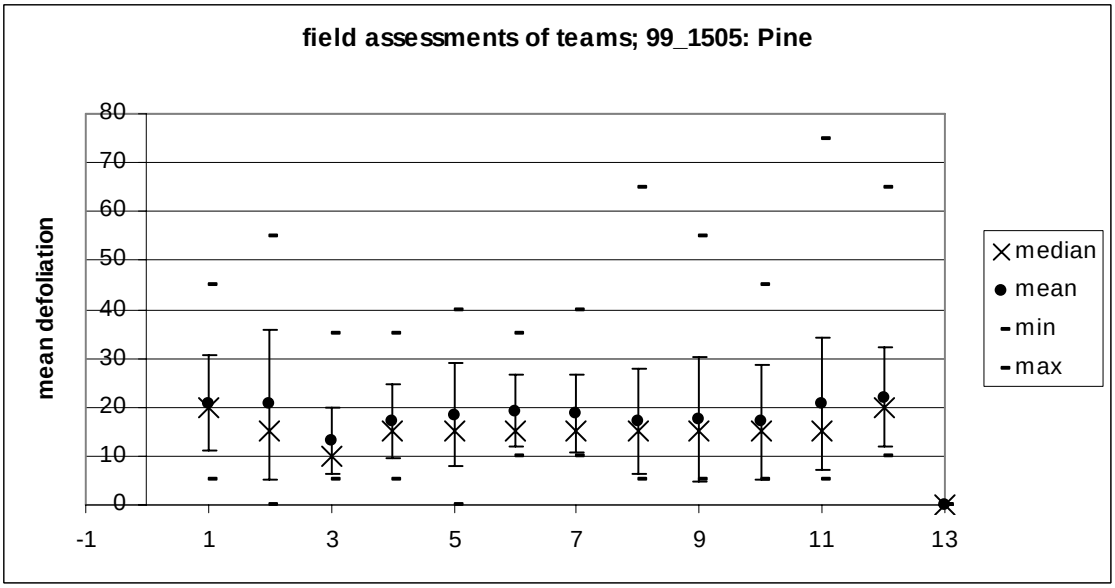
	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	4.1										
EST1_3	4.6	0.1									
FIN	1.6	8.4	10.8								
GER	0.0	2.8	3.4	0.8							
LAT	3.7	0.7	0.3	10.4	2.7						
LIT	2.2	1.3	0.9	7.8	1.6	0.2					
NOR	0.0	4.1	4.5	1.0	0.0	3.5	2.1				
RUS	7.6	0.0	0.4	14.8	5.5	1.5	2.7	7.3			
SWE	1.2	0.8	0.5	3.8	0.9	0.1	0.0	1.3	1.5		
NOR_L2	1.2	7.7	9.5	0.0	0.6	8.9	6.7	0.7	13.5	3.5	
EST_whole	10.9	19.5	27.7	3.0	5.6	30.8	26.8	7.6	34.0	11.7	4.3

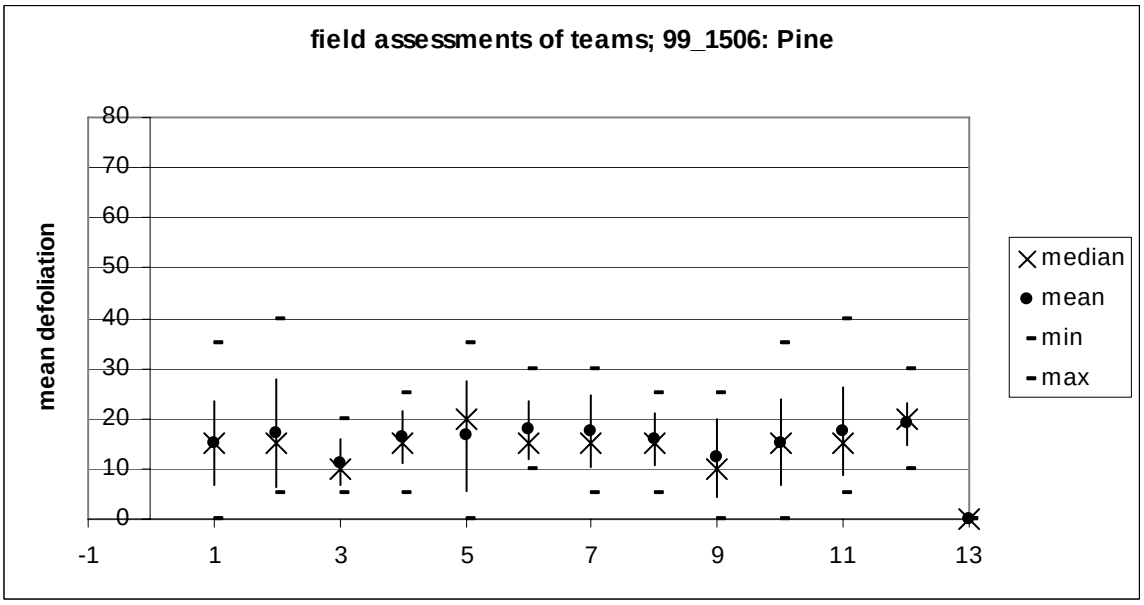
Annex 5: Finland, Correlation coefficient for Norway spruce: significant correlation coefficients shaded (α=0.05).

	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	0.79										
EST1_3	0.70	0.80									
FIN	0.70	0.77	0.74								
GER	0.68	0.79	0.75	0.77							
LAT	0.73	0.79	0.77	0.74	0.80						
LIT	0.66	0.71	0.62	0.75	0.62	0.64					
NOR	0.56	0.75	0.78	0.88	0.72	0.67	0.66				
RUS	0.57	0.57	0.50	0.42	0.54	0.61	0.52	0.38			
SWE	0.70	0.83	0.72	0.88	0.79	0.73	0.77	0.83	0.49		
NOR_L2	0.72	0.76	0.67	0.76	0.67	0.67	0.84	0.71	0.57	0.83	
EST_whole	0.49	0.57	0.74	0.47	0.63	0.63	0.43	0.50	0.61	0.47	0.54

Annex 6: ICC Finland, distribution of assessments for Scots pine.







Annex 7: ICC Finland, frequency of absolute differences lower or equal 5%, 10%, and 20% for Scots pine.

40											
absdif +/-5	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	73										
3	67	60									
4	73	68	77								
5	73	79	63	63							
6	83	77	68	80	81						
7	76	79	65	72	81	87					
8	67	63	71	91	63	76	68				
9	73	61	75	71	68	79	69	61			
10	73	72	79	69	65	71	79	56	75		
11	69	57	56	73	61	75	72	71	53	55	
12	75	60	53	79	57	87	73	77	53	48	73

60											
bsdif +/-10	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	87										
3	87	84									
4	92	80	92								
5	96	92	81	88							
6	100	88	93	99	97						
7	96	93	85	93	97	99					
8	91	79	89	95	77	91	81				
9	96	84	91	93	95	95	92	93			
10	93	89	91	85	96	95	93	81	96		
11	87	80	77	91	83	88	83	89	77	79	
12	92	80	93	95	84	95	96	95	83	87	93

90											
bsdif +/-20	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	99										
3	97	95									
4	100	97	100								
5	100	96	100	100							
6	100	99	99	100	100						
7	100	93	100	100	100	100					
8	93	91	97	97	96	99	97				
9	100	96	99	100	99	99	99	99			
10	100	97	99	100	100	100	99	99	100		
11	97	91	97	96	97	97	97	99	99	97	
12	97	97	99	99	99	99	99	99	99	100	99

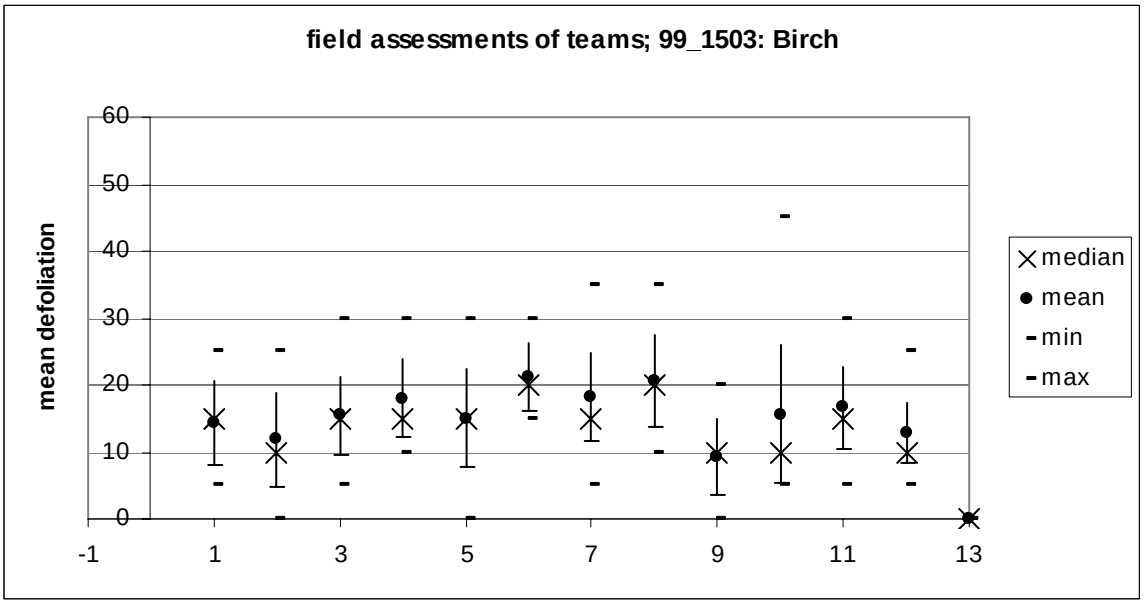
Annex 8: Kruskal-Wallis test for Scots pine: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

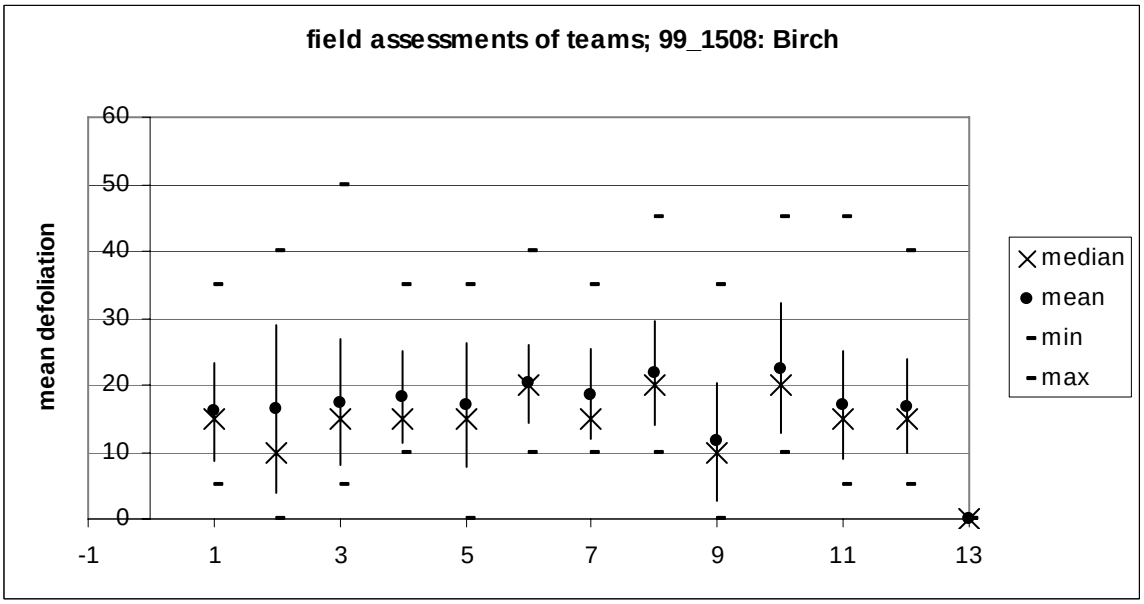
	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	0.0										
EST1_3	12.9	10.8									
FIN	0.5	0.5	14.2								
GER	0.0	0.1	9.6	0.4							
LAT	0.5	0.3	24.7	2.9	0.4						
LIT	0.3	0.1	19.7	1.9	0.2	0.0					
NOR	0.7	0.6	15.4	0.0	0.5	3.3	2.2				
RUS	5.9	5.4	0.4	4.7	4.5	11.2	9.2	4.5			
SWE	4.8	4.6	0.6	4.8	3.5	10.3	8.2	4.8	0.1		
NOR_L2	0.7	0.3	20.3	2.6	0.6	0.0	0.1	2.9	10.2	9.3	
EST_whole	3.7	2.8	43.8	14.0	3.1	2.5	2.7	16.1	19.7	18.3	1.6

Annex 9: Correlation coefficient for Scots pine: significant correlation coefficients shaded (α=0.05).

	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	0.81										
EST1_3	0.70	0.75									
FIN	0.64	0.70	0.61								
GER	0.76	0.85	0.79	0.65							
LAT	0.78	0.87	0.81	0.69	0.87						
LIT	0.67	0.83	0.71	0.64	0.87	0.79					
NOR	0.50	0.55	0.47	0.68	0.55	0.53	0.42				
RUS	0.79	0.84	0.73	0.67	0.84	0.87	0.75	0.55			
SWE	0.76	0.80	0.72	0.66	0.79	0.82	0.78	0.46	0.75		
NOR_L2	0.66	0.66	0.64	0.70	0.67	0.65	0.59	0.70	0.66	0.56	
EST_whole	0.72	0.68	0.82	0.62	0.68	0.74	0.64	0.56	0.70	0.69	0.68

Annex 10: ICC Finland, distribution of assessments for Silver birch.





Annex 11: ICC Finland, frequency of absolute differences lower or equal 5%, 10%, and 20% for Silver birch.

40											
absdif +/-5	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	66										
3	82	68									
4	78	54	82								
5	74	74	80	70							
6	60	**30**	66	84	70						
7	76	60	88	92	84	86					
8	62	**38**	60	78	64	92	76				
9	70	72	58	**32**	60	**26**	**38**	**22**			
10	64	76	70	68	74	54	76	66	46		
11	88	62	74	82	74	82	86	74	64	66	
12	84	62	92	76	78	66	76	54	72	68	80

60											
bsdif +/-10	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	92										
3	88	94									
4	96	92	98								
5	98	100	94	94							
6	96	76	90	94	88						
7	98	94	96	98	98	98					
8	88	80	84	90	92	100	96				
9	92	90	86	84	94	64	90	66			
10	86	88	88	90	88	90	94	86	72		
11	100	82	90	92	96	98	94	98	86	86	
12	100	94	96	96	96	94	98	86	94	84	100

90											
bsdif +/-20	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
2	100										
3	98	100									
4	100	100	100								
5	100	100	100	100							
6	100	100	98	100	100						
7	100	100	100	100	100	100					
8	100	98	98	100	100	100	100				
9	100	100	98	100	100	100	100	100			
10	96	100	100	100	100	100	100	100	96		
11	100	100	96	100	100	100	100	100	100	98	
12	100	100	100	100	100	100	100	100	100	98	100

Annex 12: Kruskal-Wallis test for Silver birch: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	1.9										
EST1_3	0.5	4.0									
FIN	4.9	8.7	2.7								
GER	0.3	2.4	0.0	2.3							
LAT	17.8	16.0	15.5	6.4	12.8						
LIT	5.6	9.1	3.4	0.0	2.8	5.3					
NOR	15.6	15.8	12.3	5.0	10.5	0.0	4.0				
RUS	11.2	2.1	16.5	27.3	12.6	42.0	28.2	38.1			
SWE	2.3	7.0	0.6	0.2	0.9	4.6	0.4	3.8	19.0		
NOR_L2	1.4	5.1	0.3	1.2	0.3	11.6	1.7	9.7	19.2	0.2	
EST_whole	0.1	2.2	1.0	8.0	0.8	27.3	9.0	21.0	12.4	2.6	2.5

Annex 13: Correlation coefficient for Silver birch: significant correlation coefficients shaded (α=0.05).

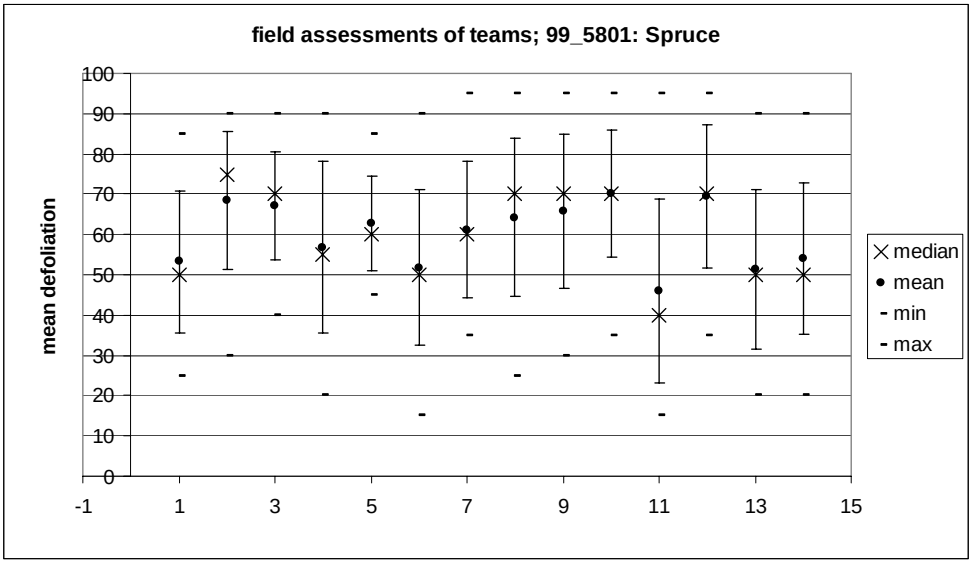
	CHZ	DK	EST1_3	FIN	GER	LAT	LIT	NOR	RUS	SWE	NOR_L2
DK	0.76										
EST1_3	0.57	0.71									
FIN	0.69	0.75	0.61								
GER	0.67	0.81	0.76	0.62							
LAT	0.68	0.67	0.47	0.59	0.62						
LIT	0.74	0.82	0.65	0.71	0.78	0.67					
NOR	0.65	0.67	0.50	0.50	0.67	0.73	0.63				
RUS	0.69	0.79	0.65	0.64	0.79	0.59	0.76	0.76			
SWE	0.68	0.77	0.65	0.63	0.71	0.57	0.77	0.64	0.66		
NOR_L2	0.75	0.64	0.46	0.55	0.62	0.75	0.68	0.79	0.66	0.60	
EST_whole	0.67	0.62	0.72	0.62	0.63	0.56	0.61	0.55	0.58	0.67	0.61

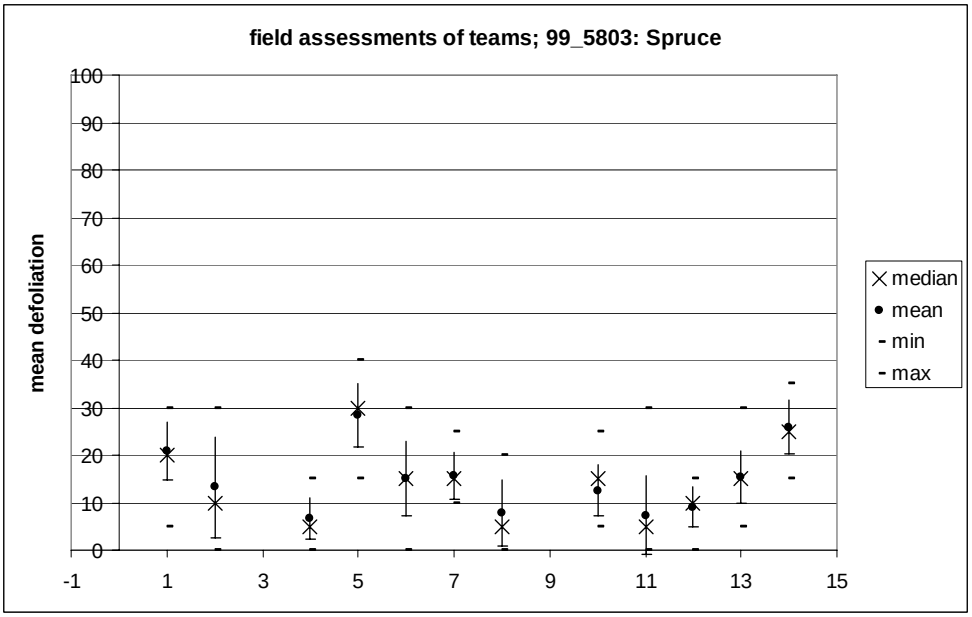
Annex 14: Participants and field teams of the ICC in Czech Republic.

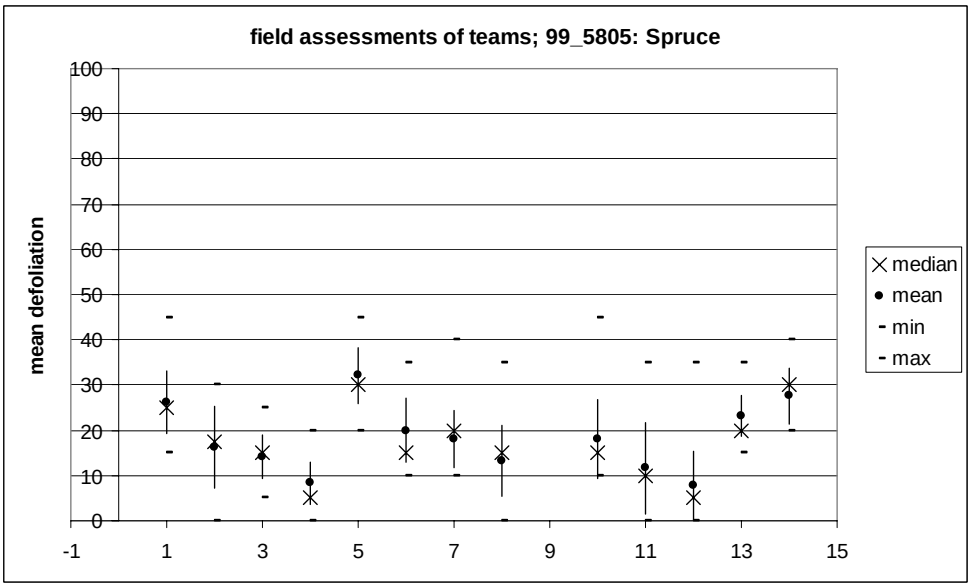
		first name	family name	team	#	Institute
1	Mr.	Bohumir	Lomsky	organization		Forestry and Game Management Research Institute (VULHM)
2	Mr.	Peter	Fabianek	organization		Forestry and Game Management Research Institute (VULHM)
3	Mr.	Volker	Mues	organization		Federal Research Centre for Forestry and Forest Products
4	Mr.	Jozef	Pajtik	Slovak	1	Forest Research Institute Zvolen
5	Mr.	Milan	Menus	Slovak	1	Forest Research Institute Zvolen
6	Ms.	Inge	Dammann	GER1	2	Forest Research Institute, Lower Saxony
7	Ms.	Sigrid	Strich	GER2	3	Federal Ministry of Consumer Protection, Food and Agriculture
8	Mr.	Alberto	Cozzi	IT	4	NFC Italy
9	Mr.	Jacopo	Ristory	IT	4	NFC Italy
10	Mr.	Steven	Hendry	UK	5	Forest Research Edinburgh
11	Mr.	Gert	Sioen	Flanders	6	Institute for Forestry and Game Management
12	Mr.	Kimmo	Siuruainen	FIN	7	Finnish Forest Research Institute
13	Mr.	Jarmo	Poikolainen	FIN	7	Finnish Forest Research Institute
14	Mr.	Stefan	Anderson	SWE, SWE_nat	8, 9	Regional Forestry Board of Södra Götaland
15	Mr.	Sören	Wulff	SWE, SWE_nat	8, 9	SLU, Dept. of Forest Resource Management and Geomatics
16	Mr.	Mogens	Egebjerg Pedersen	DEN DEN_nat	10, 11	Forest & Landscape Denmark
17	Ms.	Iben Margrete	Thomsen	DEN DEN_nat	10, 11	Forest & Landscape Denmark
18	Mr.	Pál	Kovácsevics	HUN	12	State Forest Service
19	Mr.	Tamas	Konya	HUN	12	State Forest Service
20	Mr.	Günter	Rössler	AUS	13	Federal Research and Training Centre for Forests, Natural Hazards and Landscape (BFW)
21	Mr.	Stefan	Neagu	ROM	14	Forest Research and Management Institute (ICAS)
22	Ms.	Ludmila	Bohacova	CHZ	15	Forestry and Game Management Research Institute (VULHM)
23	Mr.	Peter	Kapitola	CHZ	15	Forestry and Game Management Research Institute (VULHM)

Annex 15: ICC Czech Rep., distribution of assessments for Norway spruce.

Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	HUN	AUS	ROM	CZ
1	2	3	4	5	6	7	8	9	10	11	12	13	14







Annex 16: ICC Czech Rep., frequency of absolute differences lower or equal 5%, 10%, and 20% for Norway spruce.

absdif +/-5	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	34													
GER2	28	64												
Italy	30	37	52											
UK	46	29	35	16										
Flanders	65	40	37	46	23									
FIN	52	47	54	52	30	62								
SWE	23	62	59	59	20	48	58							
SWE_nat	24	80	52	44	36	24	56	100						
DEN	26	53	67	43	20	54	64	57	60					
DEN_nat														
HUN	26	35	28	48	16	48	35	49	20	38				
AUS	9	66	59	61	19	26	41	54	68	65		51		
ROM	64	32	30	36	30	71	64	43	28	45		43	28	
CZ	80	32	20	29	48	48	42	25	40	23		20	7	51

absdif +/-10	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	59													
GER2	46	89												
Italy	52	63	72											
UK	75	53	52	32										
Flanders	87	54	57	72	45									
FIN	87	79	87	71	64	84								
SWE	52	88	83	86	39	65	87							
SWE_nat	52	92	92	80	76	40	88	100						
DEN	61	82	91	71	48	68	90	87	80					
DEN_nat														
HUN	46	47	46	75	23	68	54	67	32	65				
AUS	36	75	89	80	36	51	74	93	96	88		67		
ROM	93	56	50	57	46	88	80	58	48	72		67	48	
CZ	97	53	41	42	81	80	74	41	56	45		36	23	86

absdif +/-20	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	87													
GER2	87	100												
Italy	87	90	93											
UK	96	81	89	61										
Flanders	97	84	87	99	90									
FIN	99	100	100	100	97	99								
SWE	93	100	100	100	75	96	100							
SWE_nat	96	100	100	100	100	92	100	100						
DEN	87	99	98	88	93	88	99	100	100					
DEN_nat														
HUN	87	71	70	94	55	99	91	84	52	77				
AUS	86	97	100	97	65	87	100	100	100	100		77		
ROM	99	84	85	93	91	100	99	90	76	84		96	84	
CZ	99	81	93	81	99	97	99	78	88	90		83	78	100

Annex 17: Czech Rep., Kruskal-Wallis test for Norway spruce: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

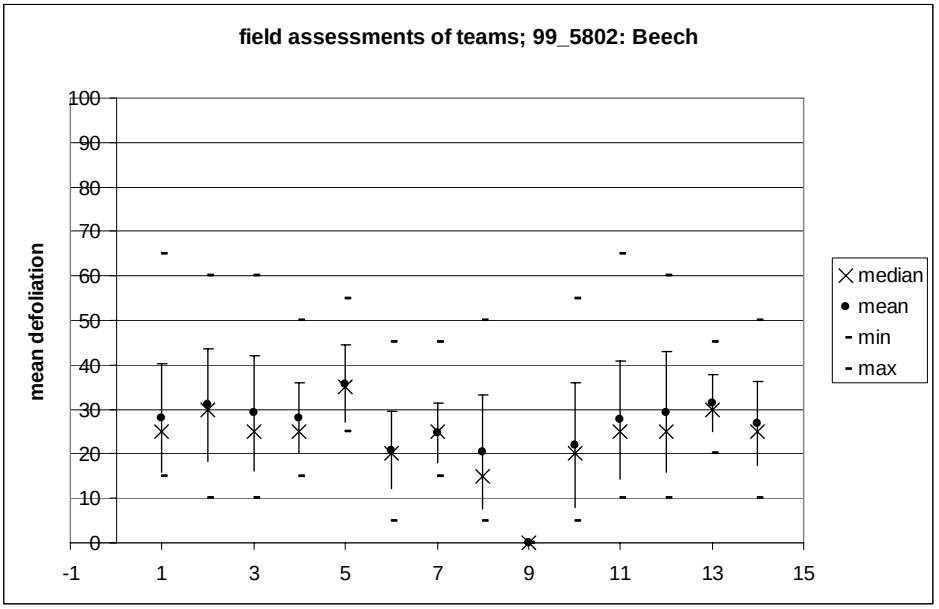
	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	HUN	AUS	ROM
GER1	1.2												
GER2	0.2	2.0											
Italy	16.7	4.9	15.5										
UK	10.9	8.7	0.2	24.4									
Flanders	5.0	0.1	3.5	8.4	19.0								
FIN	4.2	0.0	1.8	12.8	14.0	0.2							
SWE	8.8	1.7	6.7	1.4	16.2	2.0	3.5						
SWE_nat	31.1	19.6	9.9	29.2	21.7	32.7	26.7	23.4					
DEN	3.5	0.0	1.6	10.3	9.6	0.0	0.1	2.8	19.0				
HUN	17.2	5.3	15.0	0.0	32.5	7.8	10.5	1.6	36.1	8.2			
AUS	9.6	1.8	9.1	0.7	13.9	4.2	7.4	0.2	19.7	5.5	0.8		
ROM	3.3	0.0	1.7	12.1	19.7	0.5	0.2	4.3	33.0	0.5	10.5	6.8	
CZ	2.0	3.9	0.0	19.6	5.0	9.7	8.1	12.2	28.7	6.3	22.4	11.2	8.9

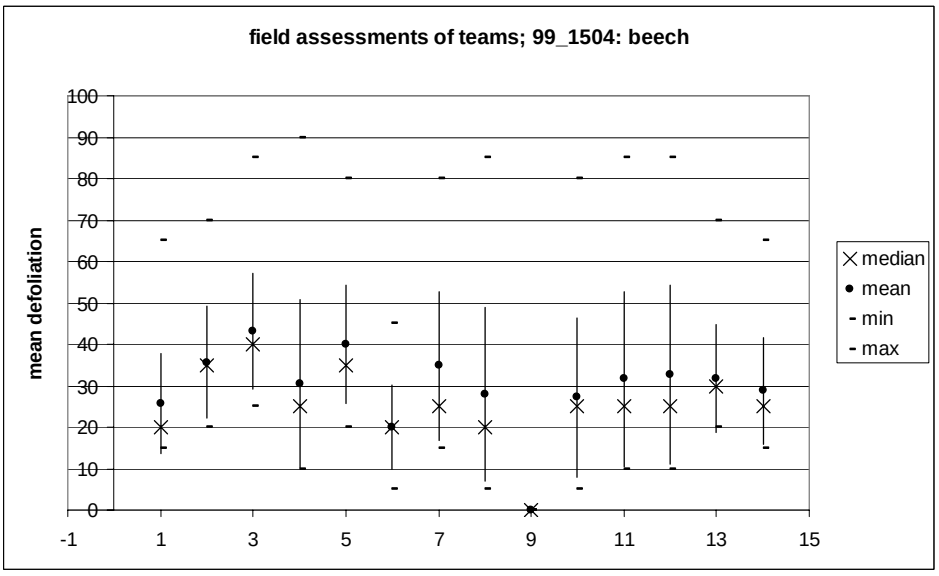
Annex 18: Czech Rep., Correlation coefficient for Norway spruce: significant correlation coefficients shaded (α=0.05).

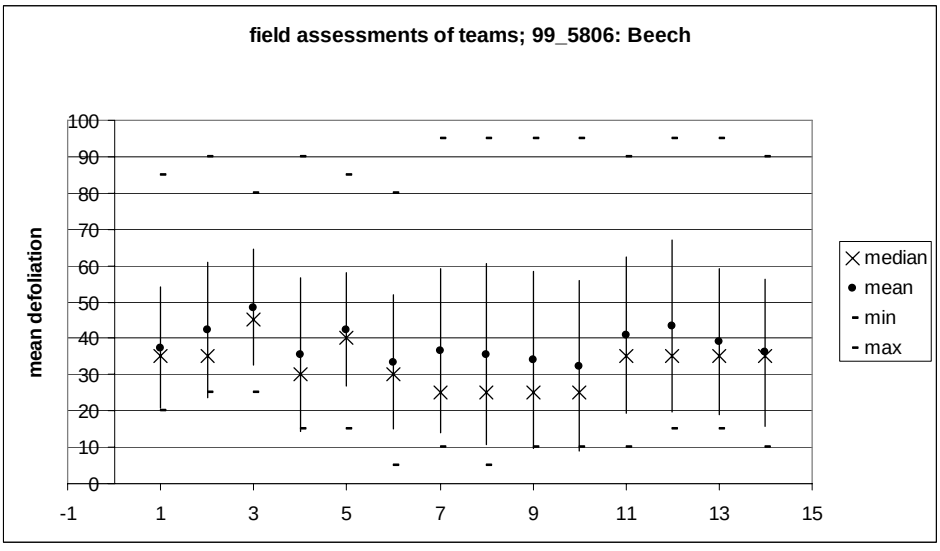
	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	0.77													
GER2	0.88	0.93												
Italy	0.73	0.74	0.95											
UK	0.81	0.85	0.92	0.80										
Flanders	0.85	0.77	0.88	0.81	0.84									
FIN	0.87	0.88	0.92	0.79	0.88	0.85								
SWE	0.85	0.92	0.93	0.81	0.86	0.84	0.91							
SWE_nat	0.94	0.95	0.90	0.97	0.92	0.94	0.95	0.99						
DEN	0.86	0.82	0.94	0.86	0.84	0.87	0.88	0.90	0.94					
DEN_nat	.	.	.	.	.	.	.	.	.	.				
HUN	0.77	0.75	0.87	0.81	0.77	0.85	0.79	0.83	0.86	0.87	.			
AUS	0.73	0.75	0.94	0.83	0.77	0.79	0.80	0.78	0.94	0.84	.	0.83		
ROM	0.86	0.74	0.86	0.76	0.80	0.87	0.82	0.84	0.81	0.86	.	0.82	0.74	
CZ	0.85	0.72	0.86	0.71	0.76	0.84	0.78	0.76	0.90	0.79	.	0.76	0.76	0.81

Annex 19: ICC Czech Rep., distribution of assessments for beech.

Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	DEN_nat	DEN	HUN	AUS	ROM	CZ
1	2	3	4	5	6	7	8	9	10	11	12	13	14







Annex 20: ICC Czech Rep., frequency of absolute differences lower or equal 5%, 10%, and 20% for beech.

40

absdif +/-5	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	49													
GER2	33	47												
Italy	73	51	22											
UK	36	45	47	34										
Flanders	55	30	19	51	15									
FIN	62	52	31	73	34	52								
SWE	44	33	24	55	19	60	58							
SWE_nat														
DEN	41	41	21	52	26	53	56	67						
DEN_nat	46	35	17	60	35	40	60	56		69				
HUN	60	47	38	62	42	48	47	49		52	44			
AUS	59	66	39	62	37	44	62	38		41	44	51		
ROM	67	58	32	75	48	32	59	42		42	52	49	59	
CZ	83	60	40	75	44	60	69	46		56	65	73	52	69

60

bsdif +/-10	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	75													
GER2	49	76												
Italy	89	81	49											
UK	63	67	69	59										
Flanders	90	47	35	82	40									
FIN	81	78	57	90	62	75								
SWE	75	55	35	82	42	78	81							
SWE_nat														
DEN	78	60	32	81	38	75	75	88						
DEN_nat	79	54	25	88	52	63	85	83		81				
HUN	81	68	50	81	64	73	77	70		75	71			
AUS	84	85	65	79	60	68	79	67		70	67	79		
ROM	92	82	54	90	68	71	86	66		70	73	74	85	
CZ	98	71	60	96	77	92	88	77		81	87	85	83	92

90

bsdif +/-20	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	99													
GER2	79	92												
Italy	97	99	83											
UK	90	96	90	89										
Flanders	99	90	68	95	84									
FIN	92	96	88	97	90	89								
SWE	96	99	74	100	79	92	99							
SWE_nat														
DEN	99	97	75	96	78	93	97	99						
DEN_nat	94	98	81	98	83	88	98	98		98				
HUN	95	97	83	96	90	89	99	97		96	96			
AUS	97	99	92	96	92	89	93	97		95	100	96		
ROM	99	100	85	97	93	99	97	95		99	98	96	100	
CZ	100	100	83	100	96	100	98	98		100	96	98	94	100

Annex 21: Czech Rep., Kruskal-Wallis test for beech: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	DEN	DEN_nat	HUN	AUS	ROM
GER1	9.0												
GER2	18.4	3.6											
Italy	0.0	9.5	18.9										
UK	23.2	4.5	0.0	25.1									
Flanders	7.4	26.7	36.7	7.5	43.9								
FIN	0.0	9.0	16.8	0.0	23.0	8.4							
SWE	6.2	17.8	23.1	6.4	26.6	0.0	7.7						
DEN	5.0	16.8	24.5	4.9	27.5	0.0	5.9	0.0					
DEN_nat	0.3	5.1	9.0	0.3	10.6	2.3	0.6	1.9	1.8				
HUN	0.3	3.2	9.4	0.4	11.5	8.6	0.2	6.4	6.0	0.6			
AUS	1.9	2.2	8.0	1.7	10.4	14.5	1.4	11.3	10.1	2.0	0.4		
ROM	3.3	1.7	10.5	3.8	13.6	18.0	4.0	11.7	11.0	2.2	0.5	0.1	
CZ	0.2	4.5	11.7	0.2	14.4	7.0	0.1	5.2	4.5	0.4	0.0	0.6	1.2

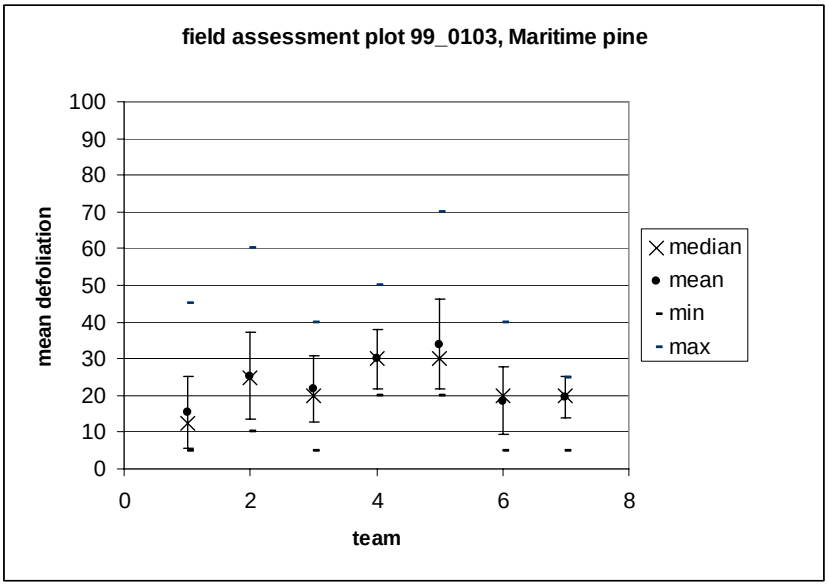
Annex 22: Czech Rep., Correlation coefficient for beech: significant correlation coefficients shaded (α=0.05).

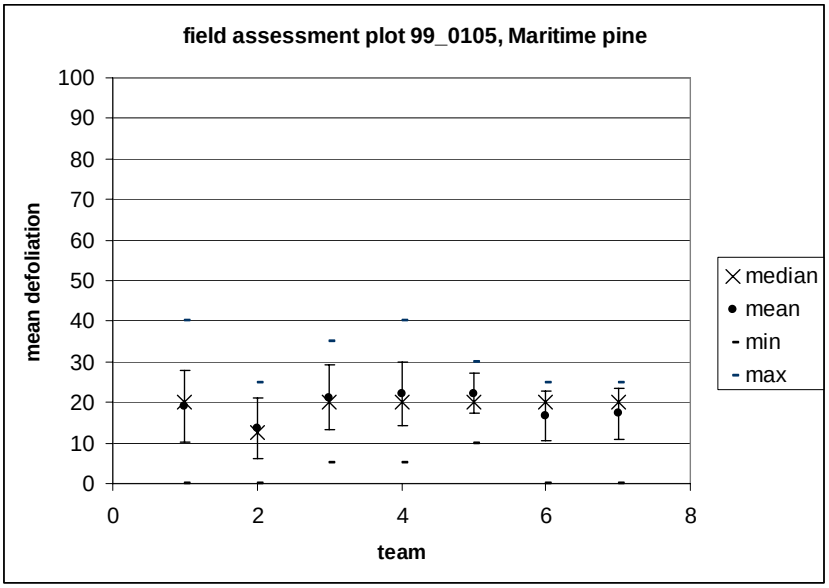
	Slovak	GER1	GER2	Italy	UK	Flanders	FIN	SWE	SWE_nat	DEN	DEN_nat	HUN	AUS	ROM
GER1	0.62													
GER2	0.53	0.68												
Italy	0.76	0.79	0.55											
UK	0.62	0.48	0.40	0.55										
Flanders	0.86	0.67	0.56	0.79	0.69									
FIN	0.65	0.68	0.59	0.72	0.48	0.71								
SWE	0.78	0.79	0.69	0.83	0.59	0.83	0.77							
SWE_nat	.	.	.	.	.	.	.	.						
DEN	0.75	0.85	0.63	0.83	0.56	0.80	0.76	0.86	.					
DEN_nat	0.78	0.71	0.74	0.86	0.66	0.74	0.82	0.85	.	0.85				
HUN	0.80	0.70	0.57	0.72	0.57	0.81	0.69	0.80	.	0.80	0.75			
AUS	0.77	0.74	0.61	0.74	0.55	0.80	0.74	0.85	.	0.78	0.79	0.73		
ROM	0.78	0.61	0.49	0.81	0.57	0.79	0.63	0.70	.	0.75	0.83	0.71	0.77	
CZ	0.87	0.66	0.57	0.76	0.79	0.91	0.74	0.78	.	0.84	0.91	0.86	0.81	0.85

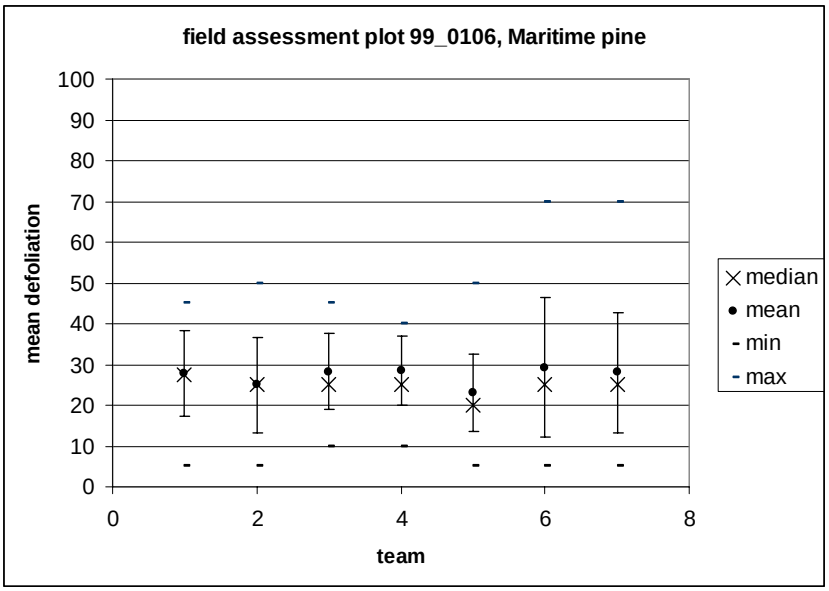
Annex 23: Participants and field teams of the ICC in France.

		first name	family name	team	#	organization
1	Mr.	Luis	Palinhos	P	5	Direcçao General dos Recursos Florestais
2	Ms.	Filomena	Mateus	P	5	Direcçao General dos Recursos Florestais
3	Mr.	Martin	Lorenz	ICP	6	Federal Research Centre for Forestry and Forests Products
4	Mr.	Heinz	Gregor	WGE	7	Umweltbundesamt Berlin
5	Mr.	Enrico	Cenni	I	4	Dept. Biologia vegetale
6	Mr.	Giuseppe	Parisi	I	4	National Forest Service
7	Ms.	Enrico	Pompei	I	4	Corpo Forestale Dello Stato
8	Mr.	Soteriou	Soteris	CYP	3	Cyprus Forestry Department
9	Mr.	Aristarchou	Aristarchos	CYP	3	Cyprus Forestry Department
10	Mr.	Jean Luc	Flot	Organization		DSF
11	Mr.	Louis Michel	Nageleisen	Organization		DSF
12	Mr.	Serge	Normand	FR2	2	DSF
13	Mr.	Pierre	Girard	FR1	1	DSF
14	Ms.	Thierry	Aumonier	FR1	1	DSF
15	Mr.	Pierre	Dupin de Saint Cyr	Organization		DSF
16	Mr.	Daniel	Reboul	FR2	2	ONF

Annex 24: ICC France, distribution of assessments for Maritime pine.
FR1 = 1, FR2=2, CY=3, I=4, P=5, ICP=6, WEG=7;







Annex 25: ICC France, frequency of absolute differences lower or equal 5%, 10%, and 20% for Maritime pine.

40						
absdif +/-5	**FR1**	**FR2**	**CY**	**I**	**P**	**ICP**
FR2	57					
CY	73	60				
I	48	57	75			
P	40	45	68	70		
ICP	62	60	67	53	43	
WGE	67	62	65	53	47	83

60						
absdif +/-10	**FR1**	**FR2**	**CY**	**I**	**P**	**ICP**
FR2	82					
CY	93	87				
I	72	87	93			
P	67	73	82	87		
ICP	88	80	90	70	68	
WGE	85	82	87	73	70	93

90						
absdif +/-20	**FR1**	**FR2**	**CY**	**I**	**P**	**ICP**
FR2	98					
CY	100	100				
I	98	97	98			
P	**85**	93	90	98		
ICP	95	95	97	93	92	
WGE	95	97	98	95	93	100

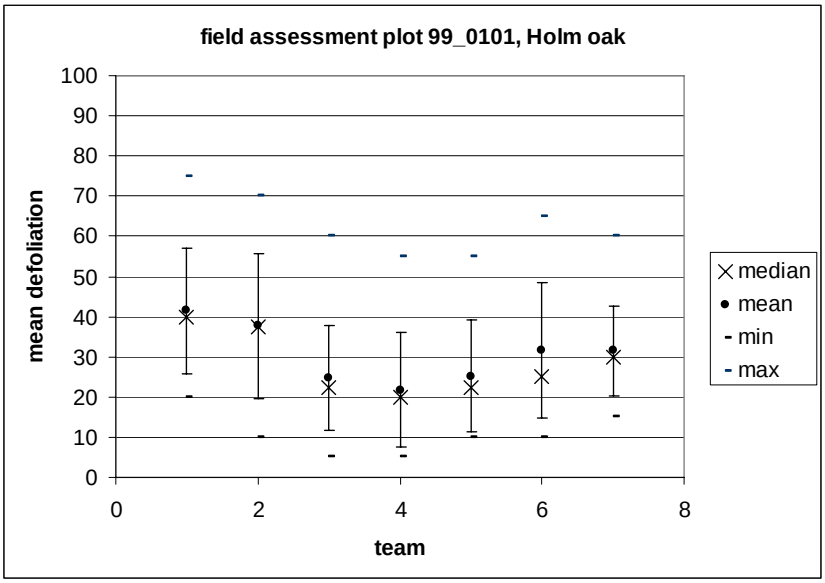
Annex 26: France, Kruskal-Wallis test for Maritime pine: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

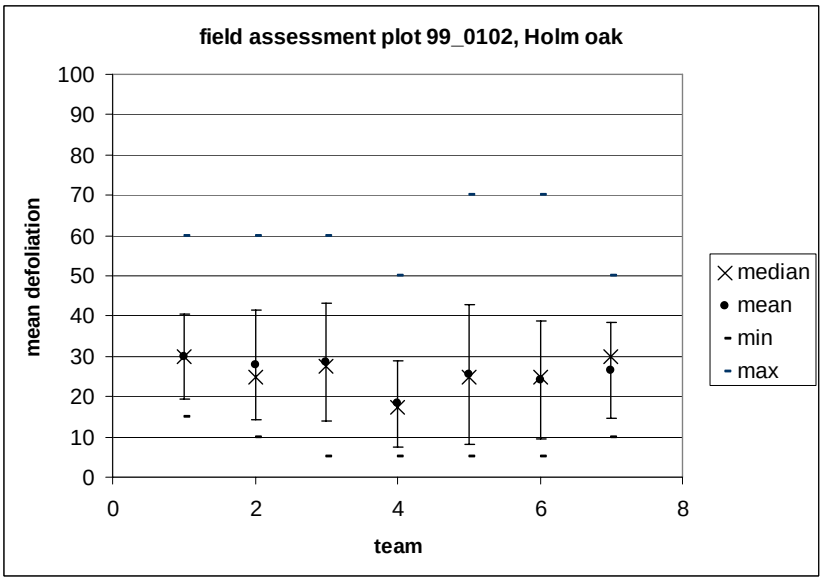
	FR1	**FR2**	**CY**	**I**	**P**	**ICP**
FR2	0.0					
CY	3.1	2.2				
I	11.5	9.9	3.8			
P	8.4	7.1	1.6	0.6		
ICP	0.0	0.2	4.0	15.5	12.2	
WGE	0.2	0.0	2.3	13.1	9.6	0.5

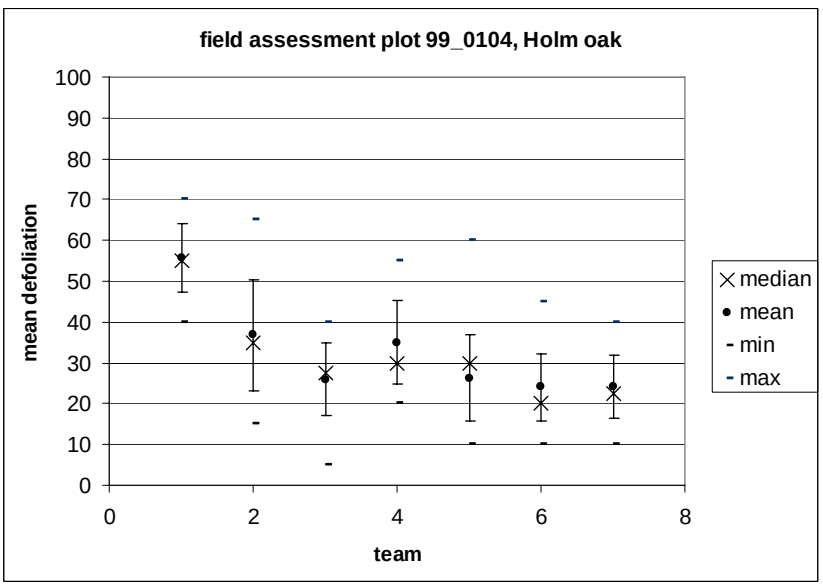
Annex 27: France, Correlation coefficient for Maritime pine: significant correlation coefficients shaded (α=0.05).

	FR1	**FR2**	**CY**	**I**	**P**	**ICP**
FR2	0.61					
CY	0.78	0.72				
I	0.55	0.74	0.72			
P	0.14	0.50	0.43	0.61		
ICP	0.69	0.68	0.79	0.59	0.61	
WGE	0.57	0.61	0.60	0.48	0.34	0.32

Annex 28: ICC France, distribution of assessments for Holm oak.
FR1 = 1, FR2=2, CY=3, I=4, P=5, ICP=6, WEG=7;







Annex 29: ICC France, frequency of absolute differences lower or equal 5%, 10%, and 20% for Holm oak.

absdif +/-5	FR1	FR2	CY	I	P	ICP
FR2	57					
CY	18	40				
I	12	43	50			
P	22	35	62	72		
ICP	25	40	73	43	62	
WGE	27	45	62	43	48	73

60						
absdif +/-10	FR1	FR2	CY	I	P	ICP
FR2	67					
CY	32	57				
I	25	63	73			
P	40	53	78	83		
ICP	45	62	88	73	87	
WGE	43	70	88	70	77	93

90						
absdif +/-20	FR1	FR2	CY	I	P	ICP
FR2	88					
CY	63	88				
I	77	90	93			
P	67	87	95	93		
ICP	70	97	95	97	95	
WGE	70	92	98	93	95	100

Annex 30: France, Kruskal-Wallis test for Holm oak: chi-test statistics which indicate significant differences between the assessments of two teams are shaded (α=0.05).

	FR1	FR2	CY	I	P	ICP
FR2	7.3					
CY	27.0	6.8				
I	29.6	9.6	0.7			
P	29.4	9.4	0.6	0.1		
ICP	26.9	7.6	0.1	0.2	0.1	
WGE	25.8	5.0	0.2	1.7	1.4	0.9

Annex 31: France, Correlation coefficient for Holm oak: significant correlation coefficients shaded (α=0.05).

	FR1	FR2	CY	I	P	ICP
FR2	0.75					
CY	0.47	0.61				
I	0.82	0.63	0.59			
P	0.52	0.61	0.68	0.69		
ICP	0.55	0.74	0.83	0.60	0.68	
WGE	0.41	0.67	0.74	0.47	0.61	0.87