Results of the combined UNECE/ICP Forests – FutMon Training Course on the Assessment of Damage Causes

(Belgium – Leuven, 14 – 17 June 2010)

Report: Action C1Dam-3(BE)

Research Institute for Nature and Forest - Gaverstraat 4 - B-9500 Geraardsbergen - T.: +32 (0)54 43 71 11 - F.: +32 (0)54 43 61 60 – info@inbo.be - www.inbo.be

Authors:
Peter Roskams, Geert Sioen
Research Institute for Nature and Forest

Research Institute for Nature and Forest
The Research Institute for Nature and Forest (INBO) is the Flemish research and knowledge centre for nature and its sustainable management and use. INBO conducts research and provides knowledge to policy advisors, policy makers and all its interested parties.

Establishment:
INBO Geraardsbergen
Gaverstraat 4, 9500 Geraardsbergen

E-mail
Peter.Roskams@inbo.be
Geert.Sioen@inbo.be

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INTERNATIONAL COOPERATIVE PROGRAMME ON ASSESSMENT AND
MONITORING OF AIR POLLUTION EFFECTS ON FORESTS (ICP FORESTS)

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LIFE+07 ENV/D/000218

Action C1-Dam-3(BE): Quality, expertise and evaluations within tree damage Assessments

Contents

Introduction

In 2005 a new method for the assessment of damage causes was implemented in the ICP Forests. Until then tree related monitoring data consisted of crown condition characteristics, essentially defoliation and discolouration, and growth and phenology data. Information on the causes of damage to trees, like pests and diseases or adverse weather conditions, was very limited and was restricted to the so called T1-T8 data, basic information mainly indicating presence/absence of damage by insects, fungi and other factors. With the implementation of the new submanual more comprehensive and quantitative data on the causes of changes in tree condition and their influence on crown condition became available.

The collected data include a description of the affected tree parts, the observed symptoms, their extent and the biotic/abiotic factors responsible for the observed damage. The use of codes instead of written comments leads to more standardisation and facilitates statistical analysis and interpretation of the data. The use of a stepwise, hierarchical reporting system, allows different levels of detail when describing the observed damage.

First results of these assessments confirmed their value for the monitoring programme, but they also indicated the need for data quality control, training and further harmonisation.

As part of FutMon action C1-Dam-3(BE) a training course on the Assessment of Damage Causes was organised in Belgium – Leuven from 14 – 17 June 2010. The course was hosted by the Research Institute for Nature and Forest of Belgium – Flanders.
The main objectives were: 1/ training in applying the guidelines on the assessment of damage causes, 2/ harmonisation and 3/ training of the observers in diagnosing damage symptoms caused by different agents.

This training course was also a first step towards the formulation of data quality indicators. Data of different observers should be comparable in order to achieve an adequate data quality. A preliminary Measurement Quality Objective, i.e. an expected level of precision for individual observations, was tested by calculating the agreement between the observer teams and a reference.

39 delegates of 18 countries participated in the meeting (annex 1).
The meeting started with an introduction to the manual and an overview of the more important biotic and abiotic agents causing damage to trees in different parts of Europe and was completed by a photo exercise (annex 2: agenda).

1. Photo exercise

The photo exercise included 15 pictures of trees showing damage symptoms.
The participants were asked to describe the symptom the way they would do at the occasion of their national forest condition inventory, using the guidelines and the codes of the ICP Forests manual / FutMon protocol.

The requested information included codes for: 1/ affected part of the tree, 2/ symptom, 3/ specification of symptom and 4/ cause (voluntary).

The exercise was executed by 17 countries: Austria, Belgium/Wallonia, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Ireland, Italy, Turkey, Lithuania, Netherlands,

Norway, Romania, Spain and Sweden. Belgium-Flanders was the organising team and acted as reference team for the analysis of the results.

Countries with more than one representative worked together for the photo exercise, except Turkey (2 groups) and Germany (3 groups). In total, results of 20 forms were discussed.

This exercise was intended to give a first, more general overview of differences in applying the manual guidelines. The results were also used as input for discussion in the field training course.

A separate report of the photo exercise, including all pictures and symptom descriptions, is included as annex 3.

1.1. Results

For each picture one symptom had to be described. This guideline was not always respected, resulting in more than 20 answers for the respective photograph. In these cases all reported symptoms have been included in the analysis, even if more than 1 symptom was reported for a given tree.

The coded symptom description by the participants was compared to the symptom description by the reference team. In order to have a complete match (agreement = 100 %) both the code for affected part (AP) and the symptom (S) code should be the same as the reference. Then the average agreement level for each picture was calculated (fig. 1).

For affected branches it is necessary to estimate their dimensions in order to separate between twigs (∅ < 2 cm), small and big branches (∅ = 2 - < 10 cm, ≥ 10 cm). However estimating branch dimensions on pictures proved to be difficult and this resulted sometimes in deviating symptom descriptions, even if the reported symptom was identical.
Therefore also the agreement for symptom only was calculated, regardless the affected part.

The agreement level for the symptom description (AP + S) ranges from 4 - 95 %. The overall agreement level for all pictures is 41 %. There is more agreement if only the observed symptom is considered (58 %), regardless of the affected part.

The highest agreement was found for the description of defoliator damage and mildew on oak leaves (95 %). These are widespread and well known symptoms, and the guidelines in the manual seem to lead to uniform descriptions.

There was also a good agreement for the description of stem damage due to forest harvesting (80 %), bark beetle galleries (64 %) and sunscald (62 %).

A high variability was found in the description of wilted branches, one of the typical symptoms of (a development phase in) Dutch elm disease (photo 8), and this picture resulted in the lowest agreement level (4 %). 5 different codes for affected part were reported: leaves, twigs, current year shoots, top leader shoot and branches of varying size and also for symptom 4 different codes were used (dead/dying, deformation, devoured/missing and brown discolouration).

Also for other symptoms on branches different descriptions were found, like *Sphaeropsis* shoot dieback in Scots pine (agreement level 10 %), galls on current year shoots (14 %) or pine twigs with nests of pine processionary moth caterpillars (14 %).

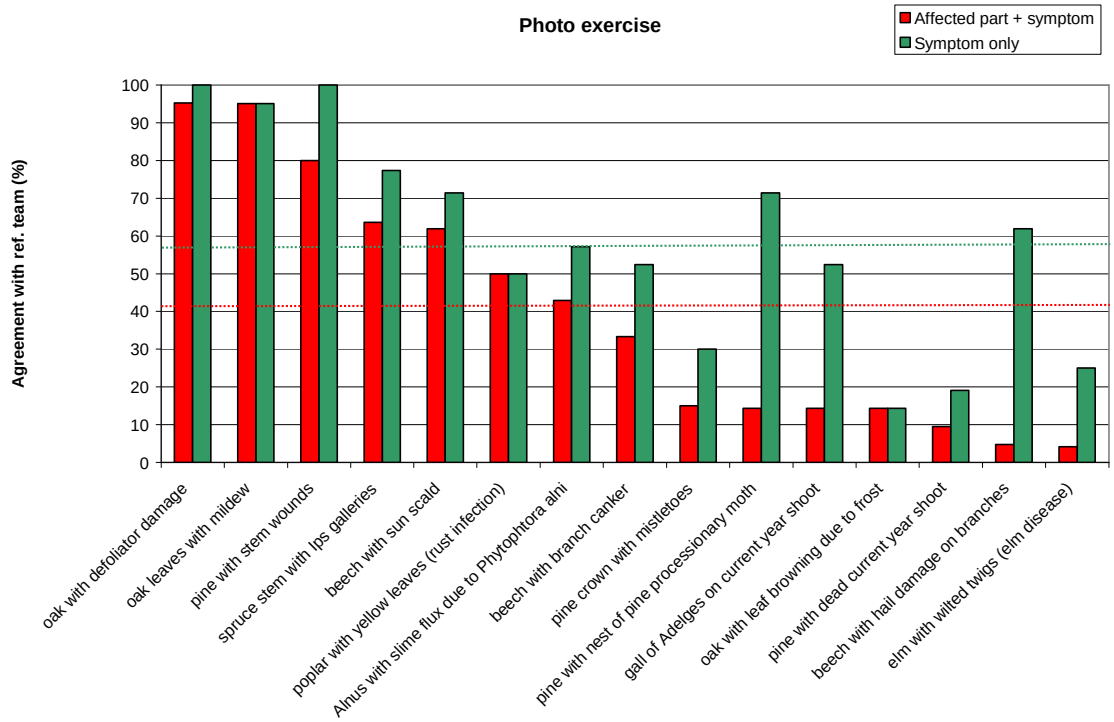


Fig. 1: Agreement (%) with the reference team for 15 pictures of damage symptoms. The red and the green line indicate the average agreement levels for 'affected part + symptom' and for 'symptom only'.

This rather high variability is partly due to difficulties when estimating dimensions of branches on pictures without a proper reference. Twigs (∅ < 2 cm) and thin branches (∅ = 2 - < 10 cm) are easily confused.
Bole versus collar and roots and foliage versus twigs/branches as affected part were other discussion points. Dead shoots in conifers were reported in 2 different ways: 1/ as brown discolouration (code 03) of the current year needles (code 11) and 2/ as dead/dying (code 14) current year shoots (code 21).

Some participants reported 'no symptom on any part of the tree' for some pictures, because on national level the symptoms shown in the picture are not on the "to be reported" list of their observers.

According to the guidelines for symptom descriptions the observed damage symptoms can be described more in detail by reporting 'symptom specifications', e.g. wounds can be specified as 'debarking', 'cracks' or 'other wounds'. This additional information may be very helpful for diagnosis of the observed damage and for data evaluations. In this photo exercise the codes for 'symptom specification' were not evaluated in a systematic way, but a quick screening of the results indicates that the use of an additional element in the symptom description leads to more variability and lower agreement levels.

1.2. Conclusions

Observers describe the same damage symptoms sometimes in different ways, indicating the need for further harmonisation.

In this photo exercise the overall agreement with the control team is 41 % for a description based on affected tree part and observed symptom.
There is more agreement if only the observed symptom is considered (58 %).

Symptoms on the leaves and on the stem seem to result in higher agreement levels than symptoms on the branches.
Branch damage on the other hand resulted in the lowest agreement scores (≤ 10 %).

Including a higher level of detail by adding a symptom specification to the description, provides more information on the observed damage type but results in more variability in the symptom descriptions.

2. Field exercise

The 2 days of field exercises focussed on the application of the guidelines for the assessment of damage causes as outlined in the FutMon/ICP Forests protocol. The results are also a first step towards determining Data Quality Objectives.

Four plots were assessed:
- plot 1: beech + oak (14 trees)
- plot 2: beech (5 trees);
- plot 3: Scots pine (15 trees)
- plot 4: oak (7 trees)

For each tree the participants gave scores for:
- overall defoliation;
- parts of the tree affected by biotic/abiotic agents;
- symptoms and symptom specifications;
- location in the crown;
- extent;
- age of the damage;
- cause(s) of the observed symptoms.

The assessments were followed by a group discussion on the scores for a selection of sample trees in each plot. 28 national teams of 1 – 3 observers participated in the exercise.

2.1. Results

Two main questions formed the basis for the evaluation of the field exercise results:

- do observers report the same trees as being affected compared to the control team and which parts of the trees are involved?
- do observers describe the observed symptoms the same way?

Therefore the scores of the teams were compared to the scores of the reference team. The results for leaves/needles, twigs/branches and stem/collar were analysed separately. This resulted in agreement levels for each plot and each team.

Agreement levels were calculated:
- on tree level: the agreement levels specify the % of common trees in which symptoms on leaves/needles, twigs/branches and stem/collar were reported by the respective team and the reference team (e.g. agreement level of 60 % for affected part "twigs/branches" means that 60 % of the trees with symptoms on this part of the tree were reported by both teams, 40 % of the trees were reported by 1 team only: either the respective team or the reference team;
- on symptom level: the agreement levels specify the % of common symptoms on leaves/needles, twigs/branches and stem/collar for all trees in the plot. In order to have a complete match (100 % agreement) between the team and the reference team both the code for affected part (AP) and the symptom code (S) should be identical.

For each plot is calculated how many teams (%) achieved ≥70 % agreement with the control, as a first step towards defining a Measurement Quality Objective.

2.1.1. Affected trees

Plot 1

This plot was a circular trail with 14 numbered trees: 7 beeches (*Fagus sylvatica)* and 7 oaks (*Quercus robur, Q. petraea*).

The reference team reported:

- leaf damage on 8 trees (1 beech + 7 oak), mainly devoured or missing leaves due to defoliators and a hail storm;
- dead or dying branches on 7 trees (all oaks);
- stem damage on 10 trees (5 beech + 5 oak): deformations, signs of insects, signs of fungi, necrosis, wounds, slime flux and decay/rot.

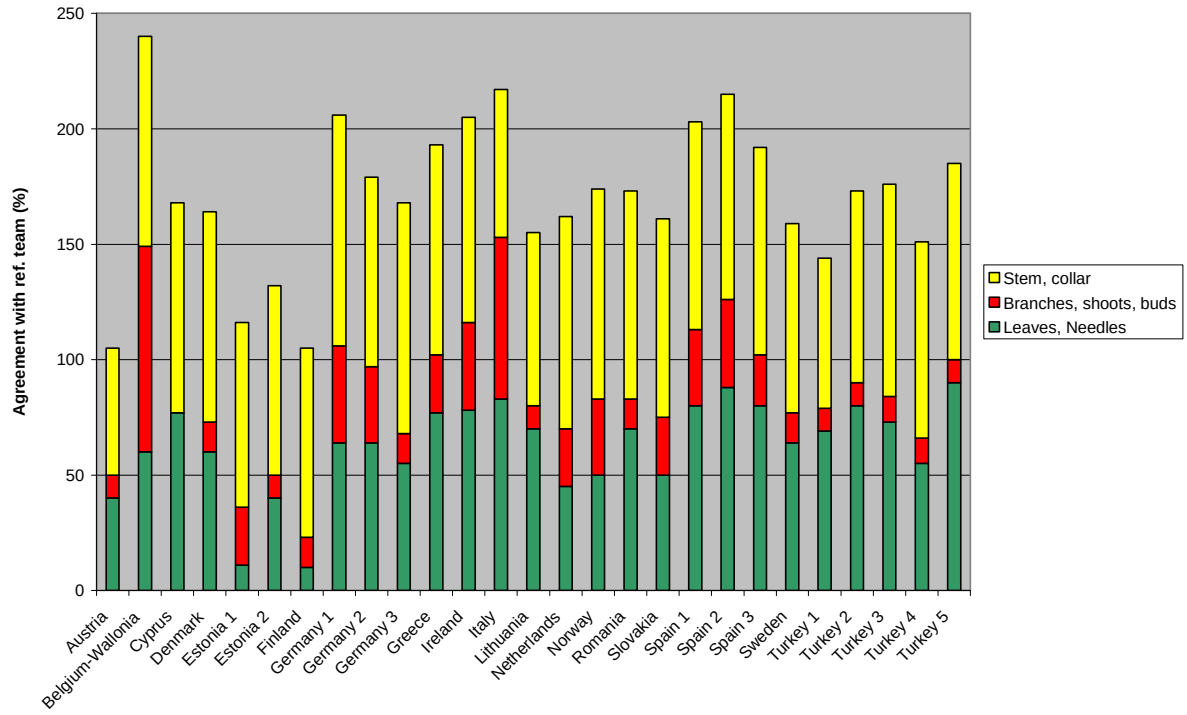


Fig. 2: Agreement (%) with the reference team on number of affected trees with symptoms on leaves, branches and stem (plot 1).

The agreement with the control for trees with affected leaves ranges from 10 to 90 % (fig. 2). 44 % of the teams have an agreement score ≥70 % with the control, 67 % if a threshold agreement score of 60 % is applied.

There is good agreement on trees with stem damage. 89 % of the teams have an agreement score ≥ 70 % with the control and 96 % if a threshold agreement score of 60 % is applied

For trees with branch damage more variability and lower agreement is found: the % of common sample trees ranges from 0 to 89 % and only 7 % of the teams are within a 70 % threshold agreement and this figure also applies for a 60 % threshold agreement.

Plot 2

This plot consisted of 5 beech trees.
The reference team reported:

- affected branches on 5 trees (dead/dying, cankers);
- stem damage on 2 trees (tumors, other deformations)

Given the low number of sample trees, the agreement scores give indications only.

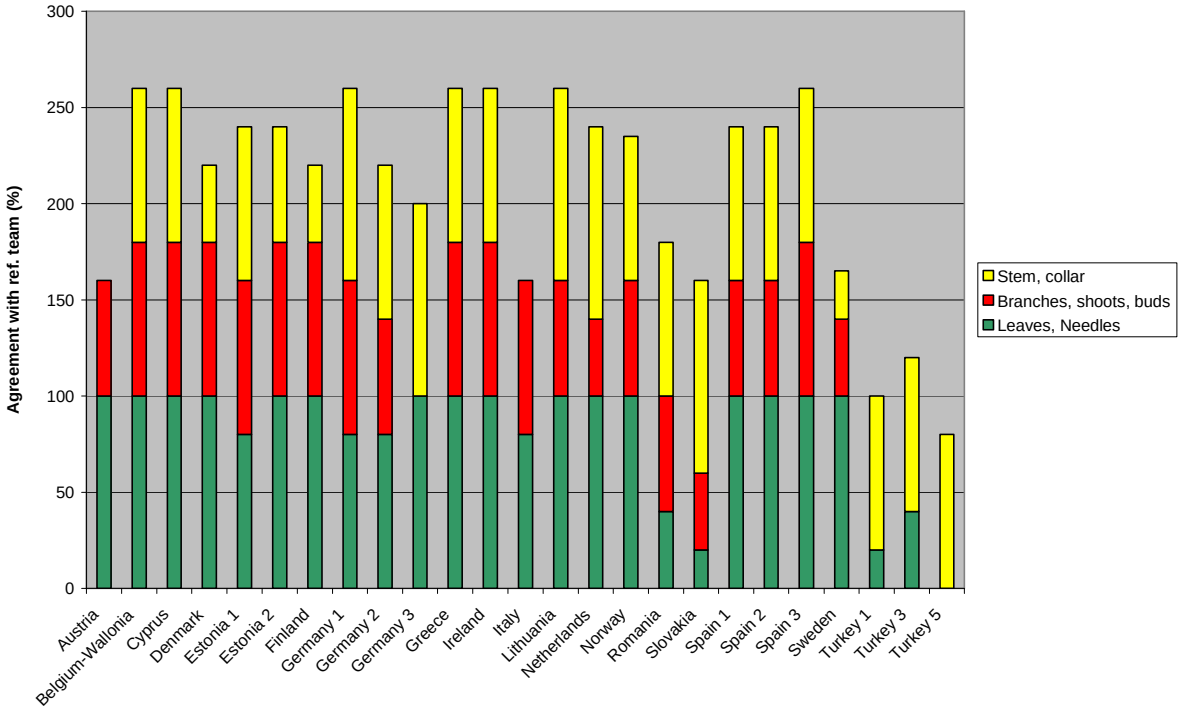


Fig. 3: Agreement (%) with the reference team on number of affected trees with symptoms on leaves, branches and stem (plot 2).

The reference team reported no leaf damage in this plot. This was confirmed by 16 teams, while 8 teams reported affected leaves for at least 1 tree. 80 % of the teams have an agreement score ≥ 70 % with the control.

There is also good agreement on the trees with stem damage: 76 % of the teams are within the ≥ 70 % threshold with the control.

For trees with branch damage there is more variability and lower agreement: 44 % of the teams have an agreement score ≥ 70 % with the control and 72 % if a 60 % threshold is applied.

Plot 3

This plot included 15 trees in a Scots pine stand. In July 2007 a hail storm caused severe damage here and many trees had to be cut after the storm, the remaining ones suffered from

branch and stem damage. 1 tree was infected by stem rust (*Peridermium / Cronartium*). Several teams did not manage to assess all sample trees.

The reference team reported:

- dead or dying branches on 15 trees;
- stem damage on 9 trees: deformations, signs of insects, wounds and resin flow

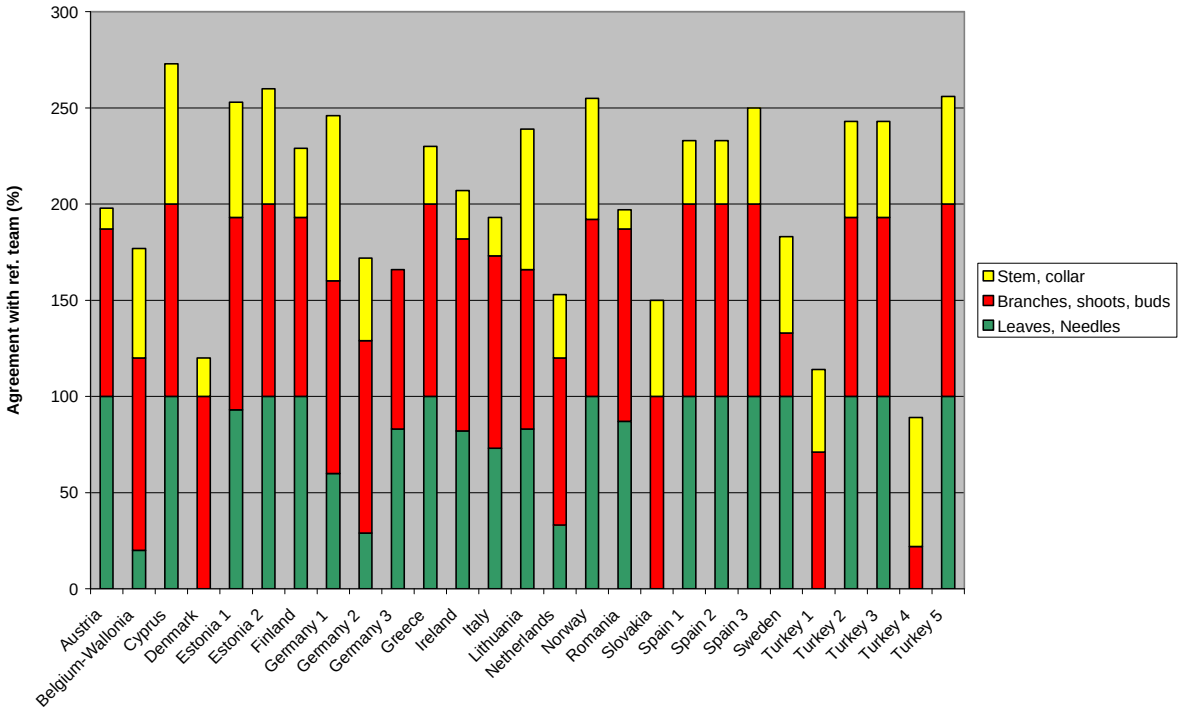


Fig. 4: Agreement (%) with the reference team on number of affected trees with symptoms on leaves, branches and stem (plot 3).

The reference team reported no needle damage in this plot. This was confirmed by 13 teams, while 14 teams reported affected needles for at least 1 tree. 70 % of the teams have an agreement score ≥ 70 % with the control.

There was good agreement for trees with branch damage: 93% of the teams have ≥ 70 % agreement with the control.

For stem damage there was little agreement in this plot: 3 teams (11 %) only have an agreement score ≥ 70 % with the control, if a threshold of 60 % agreement is applied 26 % of the teams fulfil this MQO.

Plot 4

This plot included 7 oak trees. The reference team reported:

- leaf damage: on 5 trees (defoliators)
- branch damage: on 7 trees (dead/dying, wounds)
- stem damage: on 6 trees (deformations, wounds, slime flux, signs of insects, signs of fungi)

Given the low number of sample trees, the agreement scores give indications only.

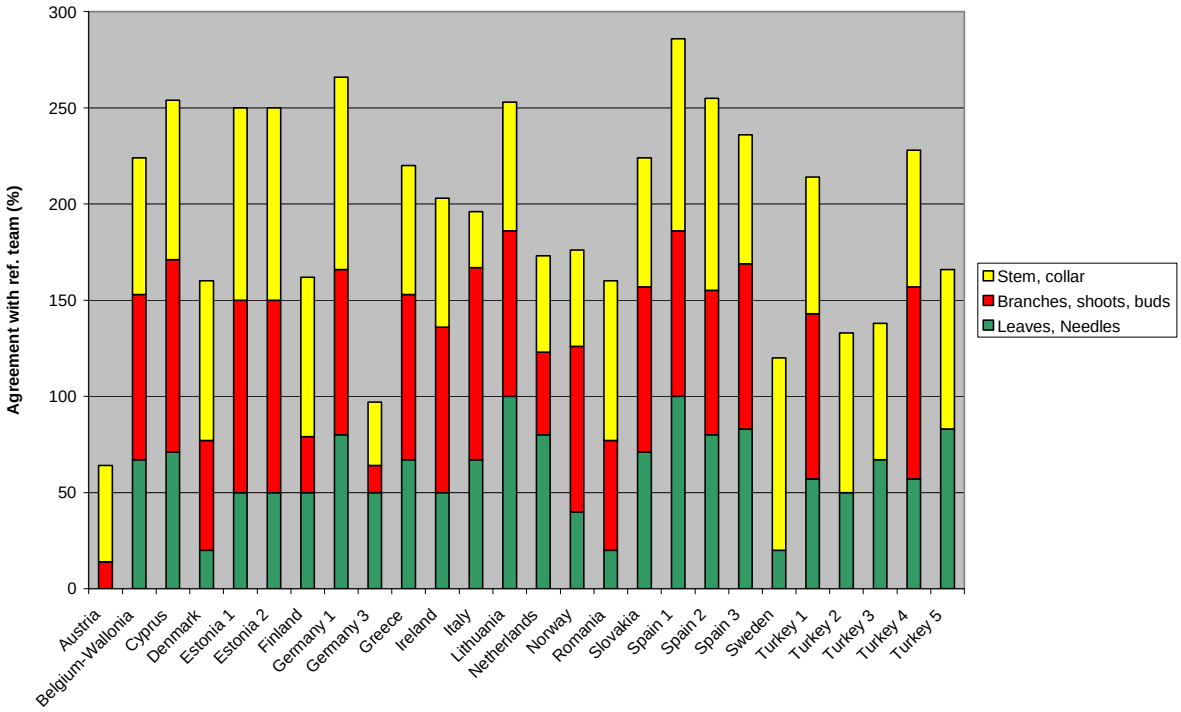


Fig. 5: Agreement (%) with the reference team on number of affected trees with symptoms on leaves, branches and stem (plot 4).

The agreement with the control for trees with affected leaves ranges from 0 to 100 % (fig. 5). 35 % of the teams have an agreement score ≥70 % with the control, 50 % if a threshold agreement score of 60 % is applied.

For trees with branch damage 62 % of the teams have an agreement of ≥70 % with the control. Also for stem damage 62 % of the teams have an agreement of ≥70 % with the control.

Overview

	Plot 1 (N = 14) (% of teams achieving MQO)	**Plot2** (N = 5) (% of teams achieving MQO)	**Plot 3** (N = 15) (% of teams achieving MQO)	**Plot 4** (N = 7) (% of teams achieving MQO)
Leaves/needles	44	80	70	35
Branches	7	44	93	62
Stem	89	76	11	62

Table 1: % of teams with ≥ 70 % agreement with control team (MQO) for affected leaves, branches and stem.

2.1.2. Symptom descriptions

For each plot the % of common symptoms on leaves/needles, twigs/branches and stem/collar with the control team is calculated. In order to have a complete match (100 % agreement) between the team and the reference team both the code for affected part (AP) and the symptom code (S) should be identical.
For each plot the achievement of the (preliminary) Measurement Quality Objective (≥ 70 % agreement with control team) is tested.

Plot 1

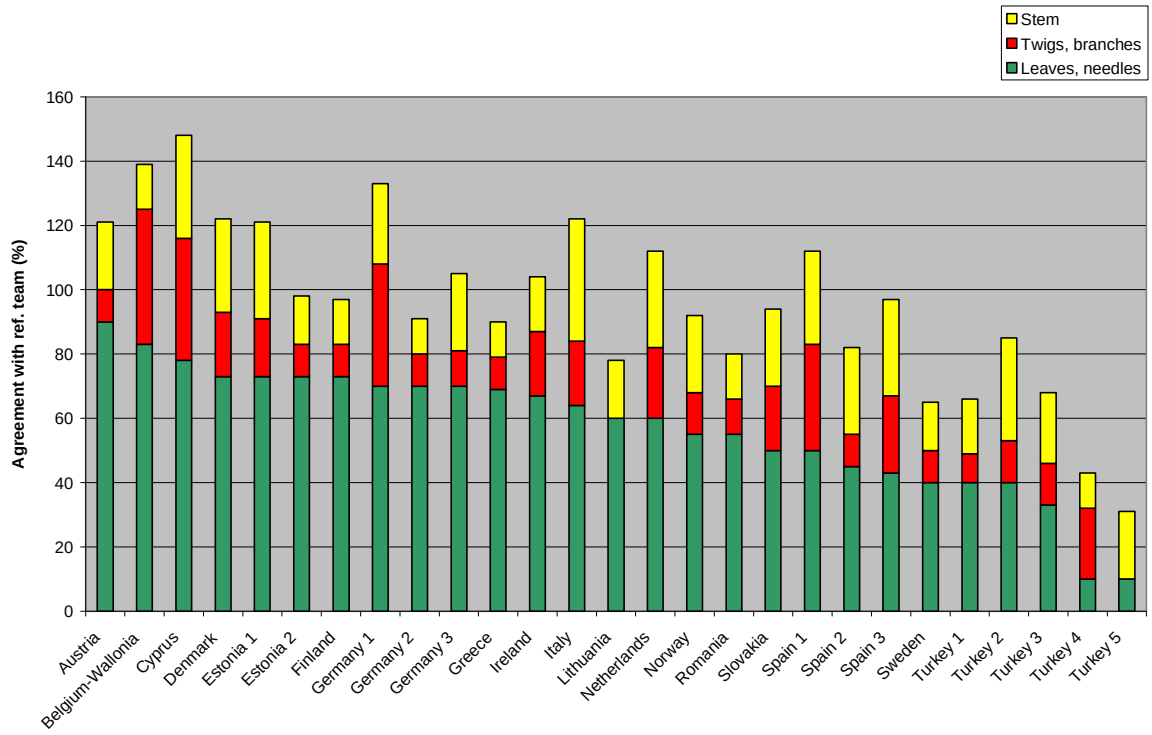


Fig. 6: Agreement with the reference team on symptom descriptions (% common symptoms on leaves, branches and stem - plot 1).

The agreement with the control for the descriptions of symptoms on leaves ranges from 10 – 90 %. 37 % of the teams have an agreement score ≥ 70 % with the control.

There is less agreement on the coded descriptions of branch and stem damage: all teams have an agreement < 50 % with the control team.

Plot 2

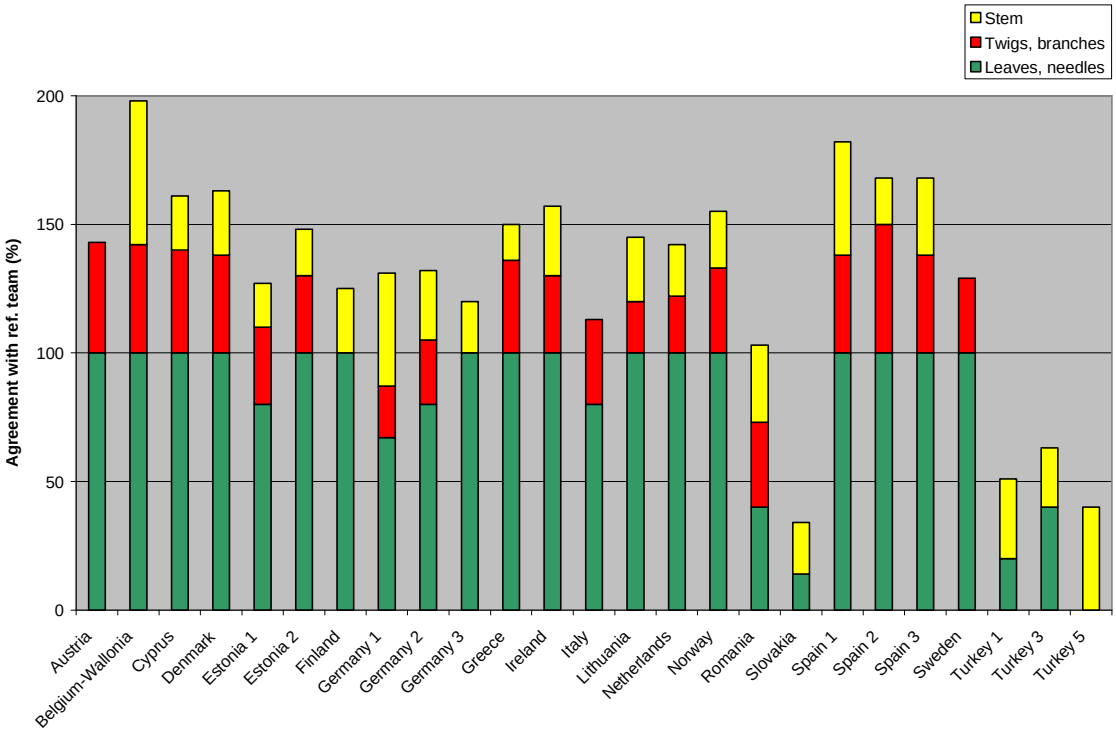


Fig. 7: Agreement with the reference team on symptom descriptions (% common symptoms on leaves, branches and stem - plot 2).

There is good agreement for the description of leaf symptoms: 76 % of the teams have an agreement with the reference team ≥ 70 %.

There is less agreement on the coded descriptions of branch and stem damage: all teams have an agreement < 60 % with the control team.

There are only 5 sample trees in this plot, so results give indications only.

Plot 3

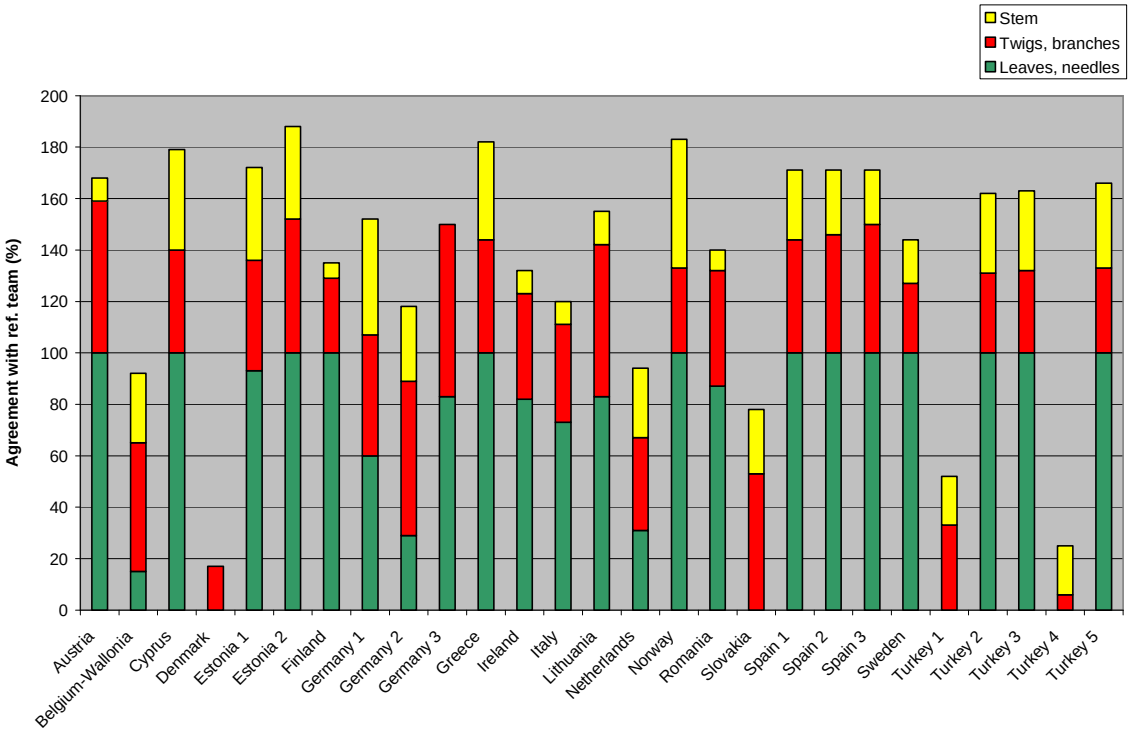


Fig. 8: Agreement with the reference team on symptom descriptions (% common symptoms on leaves, branches and stem - plot 3).

For the description of leaf symptoms 70 % of the teams have an agreement with the reference team ≥ 70 %.

There is less agreement on the coded descriptions of branch symptoms: no teams fulfil the MQO of ≥ 70 % agreement and only 7 % (2 teams) for a threshold of 60 % agreement.

Also for symptoms on the stem there is little agreement: no teams have an agreement score > 50 %, so MQO's of 60 % or 70 % agreement are not fulfilled.

Plot 4

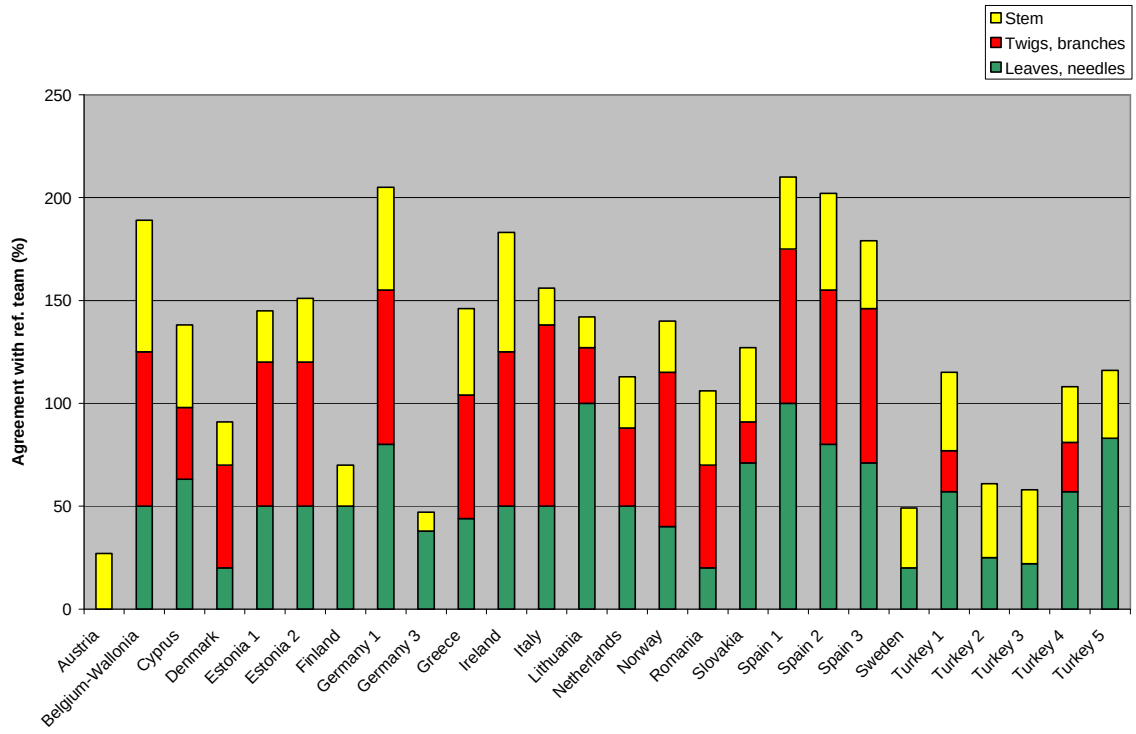


Fig. 9: Agreement with the reference team on symptom descriptions (% common symptoms on leaves, branches and stem - plot 4).

There are only 7 sample trees in this plot, so results give indications only.

The agreement with the control for the descriptions of symptoms on leaves ranges from 0 – 100 %. 27 % of the teams have an agreement with the control ≥ 70 %.

For symptoms on branches 37 % of the teams have ≥ 70 % agreement with the control. For stem damage there is less agreement: none of the teams achieved the preliminary Measurement Quality Objective of ≥ 70 % agreement with the control.

3. Conclusions

In this training course 28 observer teams of 19 countries assessed the condition of forest trees, the occurrence and the impact of biotic and abiotic damage factors and the symptoms they cause.

The guidelines in the manual for the Assessment of Crown Condition and Damaging Agents were elucidated and the participants received training in the practical implementation of the guidelines in the field and in diagnosing damage symptoms caused by biotic and abiotic agents.
Based on the results of a photo exercise and a field intercomparison the performance of the observer teams was compared and suggestions for enhancing the comparability of the data were discussed.

For the comparison of the results the agreement between the scores of the observer teams and a control team were calculated. A threshold of agreement of $\geq$ 70 % with the reference team was tested as a Measurement Quality Objective (MQO).
Trees with symptoms on leaves, branches and stem were analysed separately.

The results indicate that the number of affected trees, the number of symptoms on affected tree parts (leaves, branches, stem) and their descriptions may differ between the observer teams.

The percentage of teams fulfilling the Measurement Quality Objective ranged from 7 to 93 %.
In the photo exercise symptoms on the leaves and on the stem seemed to result in higher agreement levels than symptoms on the branches. The field exercises showed a more complex picture with different results for each plot.

Explanations for the differences between observers may include: different levels of detail when reporting damage symptoms, the use of a minimum damage threshold by some teams (damage below this threshold, e.g. 10 % defoliation, is not reported) and different levels of expertise in diagnosing damage symptoms. Some teams seem to report only 1 main symptom for each tree.

Similar symptoms are sometimes described in different ways. E.g. dead current year shoots with brown needles in conifers were described as ‘dead current year shoots’ or as ‘brown current year needles’.

The detailed symptom description using codes and the agreement on this description results in lower agreement levels.
These lower agreement levels for the symptom description are partly explained by different codes for the affected part of the tree, even when the reported symptom code by the team and the reference team was exactly the same. E.g. in the event of dead branches some teams reported code 22 for affected part (branches < 2 cm diameter), while other teams used code 23 (branches 2 – 10 cm), while in both cases the same code for the symptom (dead/dying) was reported. The same applies to stem damage (code 32, trunk between collar and crown and code 33, collar). Neglecting these different codes for affected part when the same symptom code was reported, would have resulted in considerable higher agreement levels for the symptom description.

Amendments and additions to the manual, discussed at the closing session and which will be presented for adoption:

- Add a code to the symptoms list for ‘mycelium incl. rhizomorphs’;
- If the same symptom occurs on several parts of the tree, the symptom should be reported for all affected parts (e.g. on the collar and on the main trunk);
- As regards age of the damage “Old + new damage” means a continuing process, active and going on (code 3 = fresh + old damage);
- Resin flow and slime flux: ‘fresh’ means it is still moist, transparent;
- Reporting of the extent of signs of insects, fungi, … (e.g. nests of caterpillars, fruiting bodies etc.) is optional;
- A code will be added to the symptoms list for ‘totally brown or necrotic leaves/needles’. The description of the present symptom code 3 will be changed into “Partially red to brown discolouration including partial necrosis”;

Other recommendations:

- Regular training of the observers on national and international level in describing and diagnosing damage symptoms is of great importance in order to achieve more harmonisation;
- A photo guide with pictures showing frequently occurring damage symptoms including a coded symptom description could be an important instrument for achieving more harmonisation between observers.

ANNEXES

Annex 1

	Country	Surname	First name	Email adress	Institute
1	Austria	Kristöfel	Ferdinand	ferdinand.kristoefel@bfw.gv.at	BFW
2	Belgium	Hardy	Frédéric		Université Catholique de Louvain (UCL)
3	Belgium	Braem	Steve	steve.braem@uclouvain.be	Université Catholique de Louvain (UCL)
4	Belgium	Jonard	Mathieu	mathieu.jonard@uclouvain.be	Université Catholique de Louvain (UCL)
5	Belgium	Roskams	Peter	peter.roskams@inbo.be	Research Institute for Nature and Forests
6	Belgium	De Geest	Luc	luc.degeest@inbo.be	Research Institute for Nature and Forests
7	Belgium	Sioen	Geert	geert.sioen@inbo.be	Research Institute for Nature and Forests
8	Belgium	De Haeck	Tuur	arthur.dehaeck@inbo.be	Research Institute for Nature and Forests
9	Cyprus	Soteriou	Soteris	aaristarchos@fd.moa.gov.cy	Cyprus Forestry Department
10	Denmark	Thomson	Iben Margrete	IMT@life.ku.dk	Forest & Landscape, University of Copenhagen
11	Estonia	Apuhtin	Vladislav	vladislav.apuhtin@metsad.ee	Estonian Environment Information Centre
12	Estonia	Ounap	Heino	heino.ounap@metsad.ee	Estonian Environment Information Centre
13	Germany	Hilbrig	Lutz	lutz.hilbrig@vti.bund.de	vTi -Institute of Forest Ecology and Forest Inventory
14	Germany	Ziegler	Christoph	christoph.ziegler@lanuv.nrw.de	Landesamt für Natur, Umwelt und Verbraucherschutz Nordrhein-Westfalen (LANUV)
15	Germany	Engels	Friedrich	Friedrich.Engels@wald-rlp.de	Forschungsanstalt für Waldoekologie und Forstwirtschaft (FAWF) Rheinland-Pfalz
16	Germany	Dammann	Inge	inge.dammann@nw-fva.de	NW-FVA
17	Germany	Naumann	Maria	Maria.Naumann@lwf.bayern.de	Bayerische Landesanstalt für Wald und Forstwirtschaft (LWF)
18	Greece	Voulala	Maria	mv@fria.gr	Forest Research Institute of Athens
19	Finland	Nevalainen	Seppo	seppo.nevalainen@metla.fi	Finnish Forest Research Institute (METLA)
20	Ireland	Harrington	Fiona	Fiona.Harrington@coillte.ie	Coillte
21	Italy	Parisi	Giuseppi	g.parisi@corpoforestale.it	Corpo Forestale dello Stato
22	Italy	Bussotti	Filippo	filippo.bussotti@unifi.it	LINNAEAMBIENTE RA srl
23	Italy	Feducci	Matteo	deviltora@alice.it	LINNAEAMBIENTE RA srl
24	Lithuania	Beniusis	Ricardas	ricardasben@yahoo.com	Lithuanian State Forest Service
25	Netherlands	Schoonderwoerd	Henny	schoonderwoerd@silve.nl	Silve
26	Norway	Timmermann	Volkmar	tiv@skogoglandskap.no	Norwegian Institute for Forest and Landscape
27	Romania	Neagu	Stefan	biometrie@icas.ro	ICAS
28	Romania	Chira	Danut	chira@rdsbv.ro	ICAS Forest Research & Management Institute
29	Slovakia	Gubka	Andrej	gubka@nlcsk.org	National Forest Centre - Forest Research Institute Zvolen
30	Slovakia	Longauerová	Valéria	longauerova@nlcsk.org	National Forest Centre - Forest Research Institute Zvolen
31	Spain	Garcia	Paloma	at_pgarciaf@mma.es	Directorate General Nature and Forest Policy
32	Spain	Osorno	Oscar	oscarosorno@tecmena.com	TECMENA S.L
33	Spain	Manzano	Maria Jose	esma@esmasl.com	ESMA S.L.
34	Sweden	Wulff	Sören	Soren.wulff@srh.slu.se	SLU, Swedish University of Agricultural Sciences
35	Turkey	Karakaş	Ahmet	ahmet@kavak.gov.tr	Poplar and Fast Growing Tree Species Research Institute
36	Turkey	Yeni	Sungur Mehmet	sungurmehmetyeni@ogm.gov.tr	General Directorate of Forestry
37	Turkey	Özçankaya	Ikbal Meltem	meltemdu@hotmail.com	Aegean Forest Research Institute
38	Turkey	Toprak	Özgür	ozgurtoprak@ogm.gov.tr	General Directorate of Forestry
39	Turkey	Özkan	Serdar	serdarozkan@ogm.gov.tr	General Directorate of Forestry

Annex 2

FUTMON / UNECE ICP Forests
Training course on the Assessment of Damage Causes
Belgium – Leuven 14 – 17 June 2010

Agenda

Monday 14 June

13.00 – 14.00 h.:	Registration at Hotel IBIS Leuven Centrum
14.00 – 14.30 h.:	Transport to meeting room
14.30 – 18.30 h.:	Explanatory remarks on Manual Damage Causes Questions and remarks of NFCs and ICCs Photo exercise Important damage causes in N-Europe (Seppo Nevalainen – Fin), C-/W-Europe (Peter Roskams) and S-Europe (Paloma Garcia – Sp) New concept for Photo ICC (Inge Dammann)

Tuesday 15 June

8.30 – 12.30 h.:	Field exercises (oak, beech, pine, …)
12.30 – 14.00 h.:	Lunch
14.00 – 18.00 h.:	Field exercises (continued)

Wednesday 16 June

8.30 – 12.30 h.:	Field exercises (continued)
12.30 – 14.00 h.:	Lunch
14.00 – 18.00 h.:	Field exercises (continued)
19.30 h.:	Social dinner

Thursday 17 June

8.30 – 8.45 h.:	Data reporting

8.45 – 9.45h:	Discussion and conclusions
9.45 – 10.00h:	Filippo Bussotti (It) - Assessment of damage in the Italian forest monitoring programme. Problems and first results.
10.00 – 10.15h	Maria Voulala (Gr) - Impact of damages on tree crown condition in Greece
10.15 – 10.45h:	Coffee break
10.45 – 11.00h:	Ahmet Karakaş (Tur) - Assessment of Tree Condition in Turkey
11.00 – 11.15h:	Soteriou Soteris (Cy) - Defoliation and Discoloration results of Cyprus.
11.15 – 11.30h:	Friedrich Engels (Ge) - Method of the assessment on the Level I plots in Rheinland-Pfalz since 2007
11.30 – 11.45h:	Iben Margrete Thomsen (Dk) - Assessment of damage causes in NFI and FutMon in Denmark
11.45 – 12.00h:	Seppo Nevalainen (Fin) - Biotic damage and crown condition-experiences from Finland
12.00 – 12.15h:	Geert Sioen (Be) - Assessment of damage causes in the Level I plots in Flanders
12.15 – 12.30h:	Peter Roskams (Be) - Symptoms and causes in the European Level I grid
12.30 h.	Closing of meeting

Annex 3

FutMon - ICP Forests

Training Course on Assessment of Damage Causes

Leuven, 14-17 June 2010

Results of the photo exercise (14/06/2010):

The exercise was executed by 17 countries: Austria, Belgium/Wallonia, Cyprus, Denmark, Estonia, Finland, Germany, Greece, Ireland, Italy, Turkey, Lithuania, Netherlands, Norway, Romania, Spain and Sweden.

Countries with more than one member worked together for the exercise, except Turkey (2 groups) and Germany (3 groups). In total, results from 20 forms are discussed.

For each picture one symptom had to be described. Sometimes two symptoms were described instead of one. This means that there are more than 20 answers for this photo. The countries were asked to use their national methods. Therefore some participants wrote '00' for some symptoms, because they don't report them in their country.

The organisers suggested one symptom description. This one is described as the 'suggested answer'. Next to this suggested answer, the most frequent answer/symptom is also given. The more detailed the description, the less frequent the answer was found on the forms. The answers for 'cause' are not in this report. Only the results for 'symptom' and 'specification of symptom' are discussed.

1) *Pinus sp*. with wounds on the stem/collar

Suggested answer:

Specification affected part: 33
Symptom: 17
Specification of symptom: 58
Cause: 545 / silvicultural operations

The symptom code 17 was used by every member. Four participants noted 32 as specification of affected part.

Most frequent symptom description: 33/17 (on 16 forms; total: 20)
Most frequent specification of symptom: 33/17/58 (on 14 forms; total: 20)

2) *Quercus robur* with white coverage of *Microsphaera alphitoïdes* on the leaves

Suggested answer:

Specification affected part: 14
Symptom: 11
Specification of symptom: 56
Cause: 307 / MICRALP

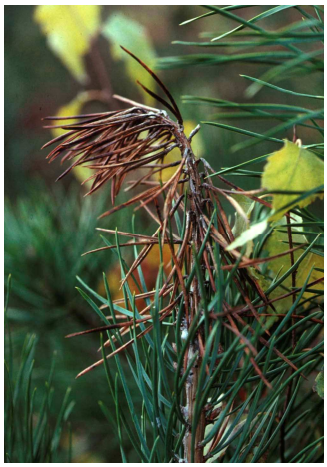
Only one participant used wrongly ‘other colour’ instead of ‘signs of fungi’. This was the picture with the highest degree of similarity between the suggested answer and the participating countries.

Most frequent symptom description: 14/11 (on 19 forms; total: 20)
Most frequent specification of symptom: 14/11/56 (on 19 forms; total: 20)

3) *Pinus sp.* with dead young shoot by *Sphaeropsis sapinea* infection

Suggested answer:

Specification affected part: 21
Symptom: 14
Specification of symptom: -
Cause: 303 / SPHASAP



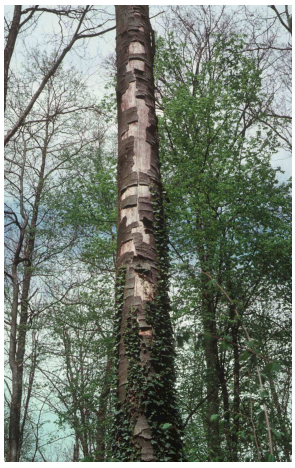
The symptom ‘dead/dying’ was noted by 4 participants, while 9 participants wrote down ‘brown discolouration - incl. necrosis’. Deformation was mentioned by 5 participants. As affected part ‘current needle year’, ‘current year shoots’ and ‘branches’ were reported. The suggested answer ‘dead current year shoots’ was noted by 2 participants.

Most frequent symptom description: 11/03 (9 times on a total of 21)
Most frequent specification of symptom: 11/03/37 (6 times; total: 21)

4) *Fagus sylvatica* with sun scald

Suggested answer:

Specification affected part: 32
Symptom: 17
Specification of symptom: 58
Cause: 426 / sun scald



On 15 forms the symptom ‘wound’ was mentioned. Two participants used the same code for the symptom (17) but wrote ‘whole trunk’ as affected part (code 34). Six symptom descriptions didn’t mention wounds, but other symptoms, like necrosis,...

Most frequent symptom description: 32/17 (13 times on a total of 21)
Most frequent specification of symptom: 32/17/58 (11 times, total: 21)

5) *Pinus sp.* with nest of *Thaumetopoea pityocampa* on the branches

Suggested answer:

Specification affected part: 22
Symptom: 10
Specification of symptom: 54
Cause: 210 / THAUPIT

The symptom ‘signs of insects’ was noted 15 times, but on different affected parts. ‘Needles of all ages’ was the most frequent reported part, but also other parts were mentioned (current needle year, older needles, current year shoots, twigs, top leader shoot). The suggested answer (twigs) was reported 3 times. Four participants mentioned needles ‘partly or totally devoured/missing’.

Most frequent symptom description: 13/10 (9 times on a total of 21)
Most frequent specification of symptom: 13/10/54 (5 times, total: 21)

6) *Populus sp.* with yellow leaves caused by infection of *Melampsora larici-populina*

Suggested answer:

Specification affected part: 14
Symptom: 02
Specification of symptom: 37
Cause: 302 / MELALAR

Every country reported ‘leaves’ as affected part. Signs of fungi and yellow discolouration (suggested answer) were both reported 10 times.

Most frequent symptom description: 14/11 (on 10 forms; total: 20) and 14/02 (on 10 forms; total: 20)
Most frequent specification of symptom: 14/11/57 (on 8 forms; total: 20)

7) *Fagus sylvatica* with canker on branch caused by infection of *Nectria ditissima*

Suggested answer:

Specification affected part: 23
Symptom: 08
Specification of symptom: 62
Cause: 309 / NECTDIT

‘Deformation’ was reported 11 times. Most of the times on branches (2 - <10cm), but in 4 cases on other affected parts (for instance smaller branches).
In 6 cases, ‘necrosis’ was reported as symptom.

Most frequent symptom description: 23/08 (7 times on a total of 21)
Most frequent specification of symptom: 23/08/62 (5 times, total: 21)

8) *Ulmus sp.* with wilted twigs caused by infection of *Ophiostoma novo-ulmi*

Suggested answer:

Specification affected part: 22
Symptom: 08
Specification of symptom: 51

Cause: 308 / OPHINOV

The results show a high variety concerning symptom description and affected part. The symptom ‘dead/dying’ was recorded 10 times, the symptom ‘deformation’ 6 times, ‘partly or totally devoured/missing’ 4 times and ‘brown discolouration - incl. necrosis’ 3 times. Only one answer was exactly the same as the suggested answer. As affected parts, leaves and different types of branches were noted (current year shoots, twigs, top leader shoot, varying size).

Most frequent symptom description: 14/08 (4 times on a total of 24)
Most frequent specification of symptom: 14/08/51 (4 times, total: 24)

9) *Fagus sylvatica* with hail damage on branches

Suggested answer:

Specification affected part: 22
Symptom: 17
Specification of symptom: 58
Cause: 425 / hail

Many participants recognized this symptom as ‘wounds’ (13 times recorded). The affected part was difficult to see: twig? size of the branch? In contrast to the suggested answer, no one recorded the specification of the symptom as ‘debarking’. Most of the time ‘cracks’ were mentioned and a few times ‘other wounds’.

Most frequent symptom description: 23/17 (8 times on a total of 21)

Most frequent specification of symptom: 23/17/59 (6 times, total: 21)

10) *Picea abies* with deformation of young shoots by *Adelges laricis* (galls)

Suggested answer:

Specification affected part: 21
Symptom: 08
Specification of symptom: 50
Cause: 270 / ADELLAR

11 participants described these galls as deformations. Two participants used the same description as the suggested answer. The galls arise from the shoots, but 9 times ‘current needle year’ was reported as affected part. In the manual galls are considered as deformations and not as ‘signs of insects’ (8 times recorded).

Most frequent symptom description: 11/08 (7 times on a total of 21)
Most frequent specification of symptom: 11/08/50 (7 times, total: 21)

11) *Quercus sp*. with brown discolouration caused by late frost (frost damage)

Suggested answer:

Specification affected part: 14
Symptom: 03
Specification of symptom: 43
Cause: 42402 / late frost

The most frequent reported symptom was ‘deformation’ (11), followed by ‘dead/dying’ (6) and ‘discolouration’ (3).
Much participants preferred to write ‘leaves’ as affected part (12). Deformation of the leaves was reported 8 times. The suggested answer (discolouration of the leaves) was only 3 times mentioned. In 6 cases ‘dead/dying’ was used as symptom description (for current year shoots, top leader shoot, branches, varying size).

Most frequent symptom description: 14/08 (8 times on a total of 21)
Most frequent specification of symptom: 14/08/51 (8 times, total: 21)

12) *Picea abies* with galleries of *Ips typographus* on the stem

Suggested answer:

Specification affected part: 32
Symptom: 10
Specification of symptom: 65
Cause: 220 / IPSTYPO

The symptom ‘signs of insects’ was reported 17 times. ‘Galleries’ is not in the list of signs of insects on the stem. ‘Boring holes, boring dust’ is the only specification close to ‘galleries’ and that is why it was suggested. This was also reported by many participants. On three forms ‘wounds’ was reported (debarking), but this was certainly not the most important symptom.

Most frequent symptom description: 32/10 (14 times on a total of 22)
Most frequent specification of symptom: 32/10/65 (11 times, total: 22)

13) *Quercus sp.* with devoured leaves caused by geometrid moths

Suggested answer:

Specification affected part: 14
Symptom: 01
Specification of symptom: 33
Cause: 210 / defoliators

On all the forms ‘partly or totally devoured/missing leaves’ was mentioned. One participant also wrote ‘sign of insects’. Considering ‘symptom specification’, there were differences between the answers (totally devoured - code 33, skeletonised - code 34 or partly devoured - code 31).

Most frequent symptom description: 14/01 (20 times on a total of 21)
Most frequent specification of symptom: 14/01/33 (8 times, total: 21)

14) *Pinus sp.* with mistletoes caused by *Viscum album*

Suggested answer:

Specification affected part: 23
Symptom: 12
Specification of symptom: -
Cause: 81001 / VISCALB

Both ‘other signs (code 12)’ and ‘other symptom (code 09)’ were reported 6 times. The same amount of participants used (wrongly) code 08 (deformation). Again, the description of the affected part varied between the countries. Twigs and branches of all sizes (incl. varying size) were reported. Three participants gave exactly the same description as the suggested answer.

Most frequent symptom description: 23/09 (on 5 forms; total: 20)
Most frequent specification of symptom: 23/09/- (on 5 forms; total: 20)

15) *Alnus glutinosa* with slime flux, caused by infection of *Phytophthora alni*

Suggested answer:

Specification affected part: 32
Symptom: 19
Specification of symptom: -

Cause: 304 / PHYTALN

‘Slime flux’ is the most frequent reported symptom (12 times). ‘Signs of fungi’ was reported by 5 participants and ‘necrosis’ by 3 participants. ‘Crown stem’, ‘bole’ and ‘whole trunk’ were reported as affected part.

Most frequent symptom description: 32/19 (9 times on a total of 21)
Most frequent specification of symptom: 32/19/- (9 times, total: 21)

Annex 4

FUTMON / UNECE ICP Forests
Training course on the Assessment of Damage Causes
Belgium – Leuven 14 – 17 June 2010

Minutes

1. The training course was organised by the Research Institute for Nature and Forests (INBO) in the frame of the Life+ FutMon action C1Dam-3(BE). The meeting was held in Belgium, Leuven, 14 – 17 June 2010.

2. 39 delegates of 18 countries participated in the meeting (annex 1).

3. The main objectives of the course were: training in applying the guidelines on the assessment of damage causes and harmonisation. The field exercises and the group discussions contributed to the training of the observers in diagnosing damage symptoms caused by different agents.

4. The course started 14 June in the afternoon (annex 2: agenda). The first session consisted of:
   - an introduction to the guidelines on the assessment of damage causes (Peter Roskams);
   - a photo exercise on symptoms caused by biotic and abiotic agents (Geert Sioen). A report on the results of the photo exercise is attached (annex 3);
   - an overview of the more important biotic and abiotic agents in N-Europe (Seppo Nevalainen – Fin) and S-Europe (Paloma Garcia – Sp). Due to time constraints the session on C-/W-Europe had to be skipped;
   - an introduction to the new concept for the Photo ICC (Inge Dammann- Ge)
   - an introduction to the field exercises

5. The field exercises took place in the forest of Meerdaal, in the neighbourhood of the city of Leuven. Transport in the forest was done by bicycle. Prior to the start of the field work a representative of the forest service (Agency for Nature and Forests) gave an introduction to the forest management in the area.

6. In total 4 plots were assessed, 1 mixed beech – oak plot (14 trees), 1 plot in beech (5 trees), 1 plot in Scots pine (15 trees) and 1 plot in oak (7 trees). Field exercises were carried out by individual representatives or by country teams. For each tree the participants gave scores for:

- overall defoliation;
- parts of the tree affected by biotic/abiotic agents (leaves/needles, twigs/branches and stem);
- symptoms and symptom specifications;
- location in the crown;
- extent;
- age of the damage;
- cause(s) of the observed symptoms.

7. The exercises in each plot were followed by a group discussion on the scores for a selection of sample trees.

8. The results of the field exercises for each team are presented as:
   - the number of trees per plot with symptoms on leaves/needles (L), twigs/branches (B) and stem/collar (S);
   - the total number of symptoms on leaves/needles, twigs/branches and stem/collar per plot;
   - the number of trees per plot with symptoms caused by defined biotic/abiotic agent groups

9. For the evaluation of the field exercises the scores of the teams were compared to the scores of the organising team of Belgium-Flanders, which was considered as the reference team. The scores for leaves/needles, twigs/branches and stem/collar were analysed separately. This resulted in agreement levels for each plot and each team.

10. Agreement levels were calculated:
    - on tree level: the agreement levels specify the % of common trees in which symptoms on leaves/needles, twigs/branches and stem/collar were reported by the respective team and the reference team (e.g. agreement level of 60 % for affected part “twigs/branches” means that 60 % of the trees with symptoms on this part of the tree were reported by both teams, 40 % of the trees was reported by 1 team only: either the respective team or the reference team);
    - on symptom level: the agreement levels specify the % of common symptoms on leaves/needles, twigs/branches and stem/collar for all trees in the plot. In order to have a complete match (100 % agreement) between the team and the reference team both the code for affected part (SAF = specification of affected part) and the symptom code should be identical;
    - On ‘cause’ level: the agreement levels specify the % of common trees in which damage by a defined biotic/abiotic agent was reported by both teams.

11. Some general conclusions from the results of the field exercises:

    - differences between the teams are found regarding the number of trees with symptoms on defined affected parts (L, B, S), the total number of symptoms on these affected parts and the number of trees with symptoms caused by defined agent groups. Explanations for these differences may include: differences between observers regarding the level of detail when reporting damage symptoms, the use of a minimum damage threshold by some teams (damage below this threshold is not reported), different levels of expertise in diagnosing damage symptoms. Some teams seem to report only 1 main symptom for each tree;

- similar symptoms were sometimes described in different ways. E.g. dead current year shoots with brown needles in conifers were described as ‘dead current year shoots’ or as ‘brown current year needles’;
- the agreement level between the teams and the reference team amounts to max. 85 % for the occurrence of stem damage (plot I, oak + beech). For trees showing damage on leaves/needles the max. agreement level is 64 % (plot II, beech) and for trees with twig/branch damage 90 % (plot III, pine);
- overall (average for 4 plots) the agreement levels amount to 58 % for trees showing symptoms on leaves/needles, 59 % for trees with symptoms on twigs/branches and 66 % for trees with stem damage;
- the detailed symptom description using codes and the agreement on this description results in lower agreement levels. Overall the average agreement level is lowest for symptoms on the stem (24 %) and highest for symptoms on leaves (55 %). The average agreement level for symptoms on twigs/branches amounts to 31 %.
- these lower agreement levels for the symptom description are partly explained by different codes for the affected part of the tree, even when the reported symptom code by the team and the reference team was exactly the same. E.g. in the event of dead branches some teams reported code 22 for affected part (branches < 2 cm diameter), while other teams used code 23 (branches 2 – 10 cm), while in both cases the same code for the symptom (dead/dying) was reported. The same applies to stem damage (code 32, trunk between collar and crown and code 33, collar). Neglecting these different codes for affected part when the same symptom code was reported, would have resulted in considerable higher agreement levels for the symptom description;
- agreement levels for trees damaged by different agent groups were calculated for the oak + beech plot. Max. agreement levels between the teams and the reference team were found for trees showing insect damage (61 %).

12. In the closing session on 17 June problems raised during the field exercises and suggestions for amendments of the manual were discussed (see below).

13. Delegates of 8 participating countries presented the results of the assessment of damage causes in their country. A list of presentations is included (annex 2).

14. Amendments and additions to the manual, discussed at the closing session and which will be presented for adoption at the Task Force Meeting:
    - Add a code to the symptoms list for ‘mycelium incl. rhizomorphs’;
    - If the same symptom occurs on several parts of the tree, the symptom should be reported for all affected parts (e.g. on the collar and on the main trunk);
    - As regards age of the damage “Old + new damage” means a continuing process, active and going on (code 3 = fresh + old damage);
    - Resin flow and slime flux: ‘fresh’ means it is still moist, transparent;
    - Reporting of the extent of signs of insects, fungi, … (e.g. nests of caterpillars, fruiting bodies etc.) is optional;
    - A code will be added to the symptoms list for ‘totally brown or necrotic leaves/needles’. The description of the present symptom code 3 will be changed into “Partially red to brown discolouration including partial necrosis”;

15. Other recommendations:

- Regular training of the observers on national and international level in describing and diagnosing damage symptoms is of great importance in order to achieve more harmonisation;
- A photo guide with pictures showing frequently occurring damage symptoms including a coded symptom description could be an important instrument for achieving more harmonisation between observers.